ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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Another Electric Mining Lamp.

At the usual monthly meeting of the members of the Manchester Geological Society, last week, Mr. G. H. Hollingworth in the chair, Mr. M. John S. Burrows (hon. sec.) introduced a portable electric lamp for mining purposes, which has just been introduced by the Edison Electric Light Company, and which he had tried with what he described as the most satisfactory results at the Atherton Collieries. The lamp, briefly described, consists of a small strong wooden case, suspended by a strap which contains an accumulator and an incandescent lamp combined, the whole weighing about 7 pounds; this lamp will keep a light of 2½ candle-power burning for about 14 or 15 hours, when it will require to be recharged by a dynamo. The lamp is arranged in front of the accumulator with a concave enameled reflector behind it, and a thick plate of glass in front to protect it; the accumulator is provided with a switch to enable the l ght to be turned in or out as required, and it also enables the light to be turned higher as the accumulator becomes exhausted. The whole apparatus is l ept within a sufficiently small compass, about 7 inches by 5 inches by about 4 inches, so that it is not too cumbersome to be readily carried about. Mr. Burrows stated that the lamp gave a better light than four Marsant lamps, and he did not find the weight any nuisance, as the electric lamp could be carried in any position as found convenient.

Mr. J. R. Williamson (representing the Edison Company), in reply to questions, said the cost of working the lamps would be very little, as the dynamo for charging the accumulators could be driven by the colliery fan engines, and the lamps charged in the night time ready for use the next day; he did not think, however, that the lamps could be produced under 40s. each. With regard to the filaments in the lamps, they were liable to be shattered by a heavy blow on the lamp, but provision had been made to prevent the possibility of this as far as possible. The filaments were reckoned to last 500 hours before they required renewal, which was half the time allowed for lamps in ordinary use, but they had taken into consideration the rough wear and constant use in a colliery.

During the discussion which followed, the general opinion was that the cost of the lamp would be a serious drawback to the general adoption of the lamp throughout a colliery, but it was suggested that stations might be fitted up with them in various parts of a colliery, where they would be available in the case of an accident which had put out the men's ordinary safety lamps, whilst for exploration purposes after an explosion they would be very valuable.

Heat of Solution of Magnetized Iron.

Doctor Gross recently explained his theoretical views on this question at a meeting of the Physical Society of Berlin, and showed why, in accordance with them, the heat of a magnetized iron solution must naturally be greater than that of the unmagnetized metal. The same author demonstrated some two years ago, that a piece of magnetized and unmagnetized iron in a conducting fluid capable of dissolving the iron, must give a current. This current flows across the fluid from the magnetized to the unmagnetized pole, and is quite independent of the nature of the magnetization. According to his present views, the source of the electric current in this case lies in the loss of specific magnetization undergone by the molecules of iron as they pass from the solid to the fluid condition. Doctor Gross explains that solutions of various salts of iron were used in his experiments, but only neutral salts of ferric oxide yielded a result, those of ferrous oxide giving no current. He deduces from this that only the former class of salts lead to a solution of the magnets. In its commentary upon the general merit of the communication, *Nature* observes, as a remarkable coincident, that the same experimental results have been obtained by Dr. Nichols, who, although he started his experiments with theoretical views diametrically opposite to those of Doctor Gross as to the magnetic potential of solid iron and iron in solution, confesses that the heat of solution of magnetized is greater than that of unmagnetized iron.

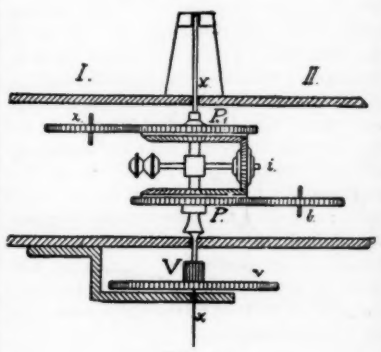


FIG. 3.

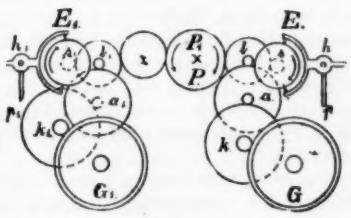


FIG. 2.

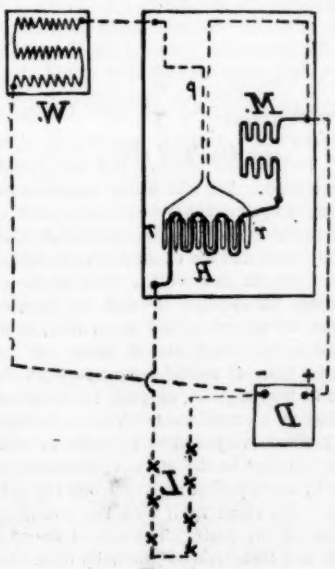


FIG. 4.

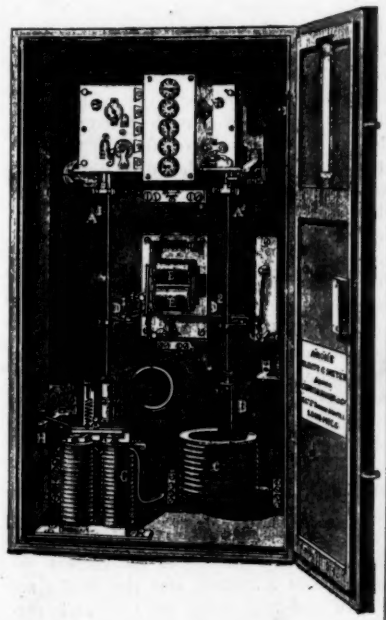


FIG. 5.

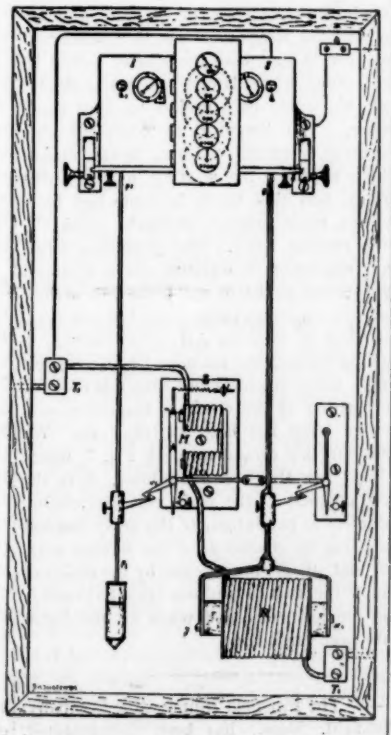


FIG. 1.

VIEWS OF ELECTRICITY METERS.

Dr. Aron's Electricity Meters.

We are indebted to our esteemed contemporary, *Industries*, of London, for the following interesting description of Dr. Aron's meters: The problem of measuring and recording the quantity of electricity supplied to an installation, which in the early days of electric lighting seemed to be one of exceptional difficulty, may now be considered as practically solved. There are many instruments in the market, some of which indicate with equal and perhaps greater accuracy than a gas meter, and this one obstacle to the introduction of a public supply of electricity is now overcome. The instruments in use may be broadly divided into two classes, viz., chemical and mechanical apparatus. An excellent example of the former is the Edison meter, as used in New York, Milan, and other places where the quantity of current is computed from the variation in weight of two zinc plates forming part of a cell through which a definite proportion of the total current is shunted. Chemical meters are also in use at the Brighton electric light installation, but in this case the electrodes are of copper, and the cell, with an additional resistance, is placed as a shunt to the incoming and outgoing mains, the current being kept constant. In this case the quantity of copper deposited is proportional to the number of volt hours, and not to the ampere hours, as in the Edison meter. But as in the one case the potential, and in the other case the current, is kept constant, the indication of either meter is practically a correct measure for the energy supplied.

Of mechanical meters there are many in the market, all depending upon the electro-dynamic action of currents upon each other or of currents upon magnets. One of the earliest meters of the former class was that devised by Professors Ayrton and Perry, and called by them an ergmeter, because in their arrangement the instrument did not measure either current or potential separately, but the integrated product of the two, that is to say, the number of ergs supplied during a given time. The apparatus is remarkable for its simplicity. It consists of an ordinary clock with a pendulum the bulb of which has been replaced by a coil of fine wire connected as a shunt to the mains and oscillating in proximity to a coil of stout wire, through which the main current, or a definite portion of the main current, passes. The same idea seems to have occurred to a German electrician, Dr. Aron, of Berlin, who has for some time been engaged in the manufacture of meters. His earliest arrangement, however, differed from that of Profs. Ayrton and Perry, inasmuch as he replaced the bulb of the pendulum not by a high resistance shunt coil, but by a steel magnet, the magnetic moment of which was carefully adjusted, so as to eliminate certain small errors which are due to the fact that the time of oscillation of a pendulum is not absolutely independent of its arc of oscillation. Many meters on this plan were made and used by the municipality of Berlin and other electric light contractors, notably the Berlin Edison Company. The next instrument made by Dr. Aron was a volt hour meter, differing from the current meter only in the fixed coil, which in this case was a high re-

sistance shunt to the incoming and outgoing mains. In all these instruments the number of ampere hours or volt hours, as the case may be, was computed by comparing the electric clock with a standard timepiece, the acceleration of the former being a measure of the electric energy supplied. But these instruments had some serious drawbacks. In the first place it was necessary to take two readings, one on the dial of the electric clock, and the other on a standard clock. In the next place it might happen that during a long period—if the acceleration exceeded twelve hours—the record of these first twelve hours was overlooked, and thus the consumer would be charged too little. Thirdly, if from any cause the electric clock should happen to stop, the record would be completely lost; and fourthly, the clocks being always going, they required re-winding at frequent intervals. The latest meters of Dr. Aron, of which a short notice was given in *Industries*, Vol. II., No. 47, are free from these objections. In the new arrangement the standard and the electric clocks are combined, and the difference of their motion only is recorded. Both clocks are arrested when the current ceases, and started again when it begins to flow, consequently re-winding is only necessary at longer intervals. The construction of the apparatus will be understood from the accompanying diagrams, which represent a watt hour meter, the pendulum of the electric clock p (Fig. 1) being weighted with a high resistance shunt solenoid r, swinging within a larger solenoid R, through which the main current passes. The instrument is contained in a wooden case about 13 inches wide by 25 inches long. The clock works I. II. are in the upper part of the casing, with the dials of the counter between them as shown. The small dials and hands to the right and left of the counter show the movement of the two escapement wheels s s_1 (Fig. 2), the two pendulums being pivoted in h h_1. Fig. 2 shows the arrangement of wheels, the main springs being within the boxes G G_1. Power is supplied to the escapement wheels by the gear k a b to s, and by k_1 a_1 b_1 to s_1. The wheel b gears direct into the wheel P, whilst b_1 gears through an intermediary wheel z into the wheel P_1 (Fig. 3). These two wheels therefore receive motion in opposite directions. To them are attached bevel wheels, gearing into the bevel pinion i mounted on a stud and counterbalanced by a weight on the other side. The boss in the center is fast on the arbor x, which moves the hand on the dial of the counter indicating hundreds. The hand on the dial above, indicating tenths, is moved by the wheel v, and the other hands of the dial are moved from the pinion V. If the time of oscillation of both pendulums were exactly equal, the wheel P would advance in one direction by exactly the same amount as the wheel P_1 would advance in the opposite direction, thus keeping the bevel pinion i stationary, and the hands on the counter would not advance, but if the pendulum p is accelerated by reason of the attractive action between the two solenoids, the wheel P will revolve at a faster rate than P_1, and the pinion i will follow in the direction of P with a speed proportional to the acceleration. Thus the counter indicates the acceleration of the electric pendulum over that of the standard clock, that is to say, the total amount of energy supplied in any given time.

As it would serve no useful purpose to keep the clocks going when no current passes, an electro-magnetic device is added to arrest the pendulums, and put them again in motion at the proper times. Where the meter is intended for an installation of arc lights in series, the electro-magnet M (Fig 1) is placed in the main circuit, and attracts its armature A as soon as the current is switched on. In Fig. 4, L are the lamps, D is the dynamo, W the artificial resistance in series with the shunt solenoid, and the other letters have the same signification as in Fig. 1. The armature A (Fig. 1) is pivoted by a flat spring m, and a spiral spring S serves to pull it off the magnet when no current passes. In this position both pendulums are arrested by catches. At the lower end of the armature is pivoted a bell crank lever v_1, the catch being on the inclined arm of this lever, whilst the vertical arm when the armature is attracted presses against a stop g, and thus the inclined arm is slightly tilted upwards, releasing the catch on the pendulum after having set the latter swinging. The other pendulum is set into motion in the same way by means of the bell crank lever v and stop f, the two levers being connected by a rod having in the middle an intervening insulating piece. The circuit is as follows: From the positive terminal of the dynamo to the terminal T_1, thence through M into the main solenoid R and to the terminal T_2. From here the current passes to the lamps and returns to the negative terminal of the dynamo. At T_1 a thin wire branch is taken off, passing down the rod of the pendulum p to y, where it is connected to the shunt solenoid. At x_1 the current passes into the rod of the pendulum, and flows by terminal t to the artificial resistance W, and back to the negative terminal of the dynamo as shown in Fig. 4. Some of these meters are in use in the arc light installation of the Ausstellungspark in Berlin, the normal current being 10 amperes, and the maximum pressure when all the lights are burning 1,500 volts. The two clocks in this instance have to be re-wound about every four weeks.

The latest form of current meter is very similar in arrangement, but instead of the electric pendulum being weighted with a shunt solenoid the usual steel magnet is adopted. The main solenoid is arranged vertically below this magnet, and a slight alteration is made in the device which starts the two clocks. It is evident that a certain definite power is required in order to insure that both pendulums should be started with a sufficiently long swing to properly actuate their escapements. Where the meter is intended for an arc light installation with practically a constant current, sufficient attraction on the armature of the starting magnet is always insured; but for incandescent installations, where the main current may be anything from $\frac{1}{2}$ ampere up to the maximum, it would evidently not be safe to rely upon this current for actuating the starting magnet. In order to overcome this objection, Dr. Aron employs for current meters a starting magnet wound with fine high resistance wire and connected as a shunt to the mains; an additional resistance being inserted into this circuit when necessary. Upon switching in the current the armature is attracted, and the clocks are started and kept going until the main current is again switched off. But as it might happen that a consumer turns out all his lamps singly without taking the trouble of going to the meter and turning off the main-switch, the connection of the starting magnet with the mains must not be a permanent one, for in that case the clocks would be kept going after lamps are extinguished, and this would be a useless waste of clock power. The inventor, to overcome this objection, arranges a break in the circuit which supplies the starting magnet with energy, and this break is controlled by a delicate relay magnet, through which the main current flows. The attraction of this relay magnet on its armature can be balanced by a spring, so that it will come into action, and send a current through the starting magnet when as little as $\frac{1}{10}$th of an ampere is flowing through the main, and as the smallest lamps made require more than this current, the starting of the clocks is insured as soon as one lamp has been switched on. We illustrate this arrangement in Fig. 5, where A^1 A^2 are the two pendulums, B is the steel magnet, C the main coil accelerating the electric pendulum, G the relay magnet operating the contact H, E the starting magnet, and D^1 D^2 the catches by the action of which the two pendulums are set vibrating, and are again arrested when all the lights have been turned out.

—— The Pittsfield Illuminating Company, Pittsfield, Mass., has been incorporated. Capital stock, $25,000. William Stanley, jr., and others, incorporators.

Practical Notes Concerning the Construction, Use and Management of Storage Batteries.

By A. Reckenzaun.

We have stated that the paste of red lead expands during oxidation, and also while sulphating. We have mentioned that this increase of volume was the main cause of the detachment of the oxide from its flat lead support. It is this expansion of the active material that has been the cause of most of the trouble experienced with lead storage batteries. Whether the paste is packed into holes, grooves, corrugations, slots or reticulations, the process of enlargement in positive plates goes on, and buckling, falling out of oxide, and other deteriorations follow. The cause is known, but it is somewhat difficult to find a remedy. We cannot prevent expansion or do away with the natural properties of oxides, but we must aim at the production of plates in which an increase of volume can occur without distorting the shape of the electrodes. The materials, active and conducting must be distributed in such a manner that any growth shall take place equally all over the surface. Until this can be accomplished, buckling and bending is sure to take place with the disastrous results well known to makers and users of secondary batteries. Oxidation of the positive plates must occur when the cells are being charged, and sulphating takes place whilst they are discharged. In the case of perforated plates the paste expands, and with it the lead support during oxidation. The lead support has practically no elasticity, therefore the paste would become loose during the discharge were it not for the compensating effects brought about by the sulphate which is formed simultaneously. If the active material did return to its original volume, then the contact between it and the metallic support would be almost destroyed. Positive plates grow slowly but continually; their volume increases gradually; and since the paste does not return to its original shape, old and well used plates must be more porous than new ones. This greater porosity may account for the increased capacity of positive plates which have been in use for a long time.

The volume of oxides relatively to their metals has been calculated by chemists. When 207 grammes or 18 44 cubic centimeters of lead unite with 16 grammes of oxygen to form Pb O, the increment of volume is found to be 2.6 cubic centimeters. In the oxidation of 112 grammes of iron to $Fe_2 O_3$, the increment of volume is 8.1 or 3×2.7 c. c.; thus 16 grammes of oxygen in chemical union with heavy metals occupy 2.6 to 2 7 cubic centimeters.

In practice, with battery plates, only a portion of the active material becomes oxidized; therefore the above proportions, which refer to atomic volumes, cannot be applied unless we know how many molecules there are exposed to the action of oxygen If every atom of the lead could be utilized, then the increase of volume from Pb to Pb O in the first stage of oxidation would alone amount to $\frac{2.6}{18.44} = 14$ per cent.; this increment, if Pb = 1, to Pb O, would be 1.14; to $Pb O_2 = 1.28$, and so on. We have found that a positive plate which had a surface of $9 \times 10 = 90$ square inches when new, grew to 94.76 square inches after one year's daily use; we only measured the expansion in the direction of length and width; older plates of the same description showed an increase of from 90 square inches when new, to 97 square inches when almost worn out. A positive plate is considered to be worn out when its lead support, or grid, is broken or cracked to a considerable extent. Metallic lead becomes very brittle in course of time when exposed to the electrolytic action of oxygen, and a period arrives when the grid refuses to extend itself with the increasing volume of the paste. The bars of the grid crack, and these cracks gradually open out, and then the whole plate becomes unserviceable.

We endeavored to strengthen the plates by providing stout ribs, diagonally, parallel to the sides, and in various other ways, but we found that this only aggravated the evil. The portions of the grid which were surrounded by strong ribs, expanded and buckled in any direction that offered the least mechanical resistance, whilst the ribs themselves did not elongate in the same ratio.

This method of stiffening grids had to be abandoned, and, finally, we came to the conclusion that any attempt to strengthen positive plates by mechanical means was fruitless. We must allow the paste free scope for expansion in every direction, and this can be done by making the grid or supporting frame of equal strength throughout, and the softer the conducting material the better for the plates. It was suggested, some five years ago, to strengthen the lead grid by providing an alloy of antimony and lead, whereby a much stiffer plate could be obtained.

When the cells are partially or wholly discharged, and then left to stand idle, sulphate is being formed, and buckling sets in at a comparatively rapid rate, even with well-constructed plates. To counteract this tendency, secondary batteries should always be kept well charged. If one face of a plate is slightly more active than the other, it is natural that the most active side will expand first, and thus become convex, and when buckling has once begun it continues very easily, and eventually the paste, for want of elasticity, will break and tumble out.

All sorts of devices have been tried to prevent buckling, and consequent contact between neighboring plates. Wooden frames were tried, grids of ebonite, india rubber, and other insulating materials have been used; bands were stretched round the plates, and, finally, rubber plugs, spaced at short distances all over the plates, have been adopted to keep them flat. All these and other kinds of separators, however, do not remove the tendency to buckling or unequal expansion; such supports are merely a rude remedy, but they do not do away with the cause. There is only one rational cure, and that is to make the grids of equal strength all over, apply the paste with care, so that it should not be more dense in one part than another, and then leave the plates as free and unconstrained as possible by giving them room for expansion. These are manufacturing details. As regards maintenance, we have already stated that excessive sulphating can be prevented by never allowing discharged cells to stand idle in acid for any length of time.

The Fulton Street Electric Railway.

The cars of the Bently-Knight system, which is being laid on Fulton street, New York, will be of what is known as the 16-foot standard, that is, about the size of the cars now used on Broadway, and capable of seating nine persons on each side. It will take two men to run each car. Brill & Co., of Philadelphia, are building the cars. It is claimed by the advocates of the Bently-Knight system that it is more economical than either horse power or cable. Only the tracks of the road are being laid at present. The conduits will be laid later. They are not yet quite ready. As the contractor is required by the city ordinance to replace the cobble-stones as fast as the track is laid, another tearing up of the street, though on a narrower scale, will be necessary when the conduits are laid. Midway between the rails of each track will be laid under ground a cylindrical conduit with a slot-like opening on top and a continuous copper rod on the interior surface of each side. The cars will be provided with a vertical metal bar analogous to the grip of the cable car. It will fit into the slot. Its lower end bar is provided with a double flange made to open outwards towards either side of the conduit when the rod is in the slot, and adjustable at the will of the person running the car. The electricity will be supplied by batteries placed under the flooring of the car. When the "grip," if it may be so called, is adjusted, connections are made between the batteries and the copper rods in the conduits, and motion is at once imparted to the car. When the grip is released the connections are broken, the motive power is withdrawn, and the car is brought to a stand by the brakes. The speed of the car can be regulated by the man who manages the grip.

The Westinghouse Brake—Further Improvements.

The *Railway Review* states that after the close of the brake trials at Burlington, that it was the intention of Mr. Westinghouse to endeavor to so improve his air-brake as to greatly quicken its application on long trains, and thus avoid as far as possible the severe shocks in the rear part of the train. He did not believe that the use of electricity would be regarded favorably by railway managers, and did believe he could overcome the shock without it. He has accordingly been studying and experimenting to that end. The cars have been kept at Burlington and the apparatus having been changed and tested in the shops at Pittsburgh, was taken to Burlington and applied to the same cars, which were then run over the brake course.

The tests made last week were very interesting as showing great progress. Our information regarding them comes from a thoroughly impartial and reliable source. The improved triple valve was used and a 1¼ inch train pipe. It will be remembered that, before, only about 25 cars could be stopped without objectionable shock. This limit has now been extended to 45 cars. With a 45 car train in emergency stops made when going at 20 miles and 40 miles an hour, the slideometer was only moved from 5 to 6 inches. The shock was not of the abrupt, severe kind such as were experienced before; but more in the nature of a slide, such as resulted to some extent with the electric brakes. It was considered by competent judges that such shocks were not seriously objectionable—especially as no shock is experienced in service stops.

When, however, the train was increased to 50 cars, a decided shock of the "rale old sort" was experienced, which moved the slideometer 30 inches. This of course shows that the time must be still further shortened for 50 car trains, and Mr. Westinghouse believes he can still gain about one-half a second, and that will be sufficient to obviate the shock. He is accordingly making new apparatus and will soon have it on the cars and make further tests at Burlington. In view of the gain already made, it seems probable that he can do it.

The speed with which the brakes now go on the rear car is remarkable. When the signal was given by whistle from the engine, that the brakes were applied, those who were on the rear car could see the steam from the whistle, and the brakes would begin to apply before the sound of the whistle was heard. It thus appears that the brakes will now apply somewhat quicker than sound will travel. This of course is not as quick as electric application. The question is, "Is it not quick enough?" If Mr. Westinghouse succeeds in overcoming the shock, the advantages claimed for electric application will be reduced to superiority in graduation and quickness of release. These will have to be balanced against the disadvantages of introducing a new element in railway operation.

A Telephone Intruder in Michigan.

A short time ago the management of the Bell Telephone Company of Detroit learned that a new organization called the St. Clair and Sanilac Telephone Company was building a line between those points with a view, ultimately, of extending it to Port Huron and introducing the Cushman telephone, a Chicago instrument. As this instrument is an alleged infringement of the Bell instrument, the Detroit office at once notified the parent company, which will probably begin injunction proceedings.

Mr. Forbes, of the Detroit office, said that the proposed operations of the new company would not materially injure the Bell Company's State business, but that it was essential to protect their rights against the Cushman instrument, which was an almost exact copy of the Bell 'phone.

"Competition in the telephone business," said Mr. Forbes, "is not possible, and no two companies can exist at the same point. I believe that it is the purpose of this new company to furnish cheaper service than the Bell company is giving. All companies that have undertaken this have since acknowledged that it was impossible to furnish service cheaper than we, and only commenced it with a view of eventually advancing the price. When two companies are doing business in a city a business house finds it necessary to use both instruments in order to accommodate the subscribers of each. Where this situation of affairs exists the cost for both services, as a matter of course, is twice as great as it would be were the business entirely in the hands of one come pany."

Two Interesting Electrical Queries.

A SPECIAL FORM OF COMMUTATOR—BATTERY ELECTRICITY.

To the Editor of Electrical Review:

(1.) Can you tell me if there is such a machine, or rather commutator, that will take the current from an induction coil and produce a steady current running one way? I am working upon a machine where I need some such a commutator, but am unable to make it down here, away from the electrical field.

(2) Please tell me if I am not right in the following: There is a line wire well grounded at both ends, and at one end there are several batteries each of a different type, such as Bi-chromate, Leclanche, Grenet, Smee, Grove, Daniel, etc., connected to the line wire, then through an electrical bell to the ground. At the other end of the line wire there are the same batteries, but connected to the wire by a key or switch. All these batteries at this end are open. If I close the switch, say of the bi-chromate battery at this end of the line, will it not ring the bell attached to the bi-chromate battery at the other end? Will it ring any other bell but its own? What I mean is that electricity generated by a certain type of battery will pass by any other type and seek its own, therefore will ring its own bell, and not the bell of any other battery.

I contend that it will ring its own battery and not any other. Am I right or wrong?

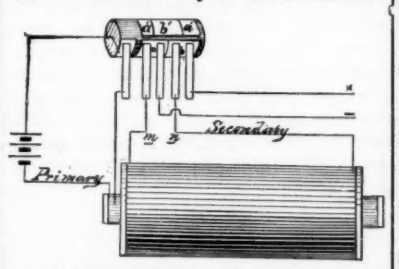
Yours, very respectfully,

F. S. PERRIN.

Stanton, Fla., June 27, 1887.

THE ANSWERS.

1. Accompanying is a sketch of a commutator which will change the reversed currents of the secondary to direct currents.



A SPECIAL FORM OF COMMUTATOR.

The drum should be of hard rubber or similar substance; the commutator strips and brushes of metal. In the revolution of the drum the primary circuit is opened and closed for definite intervals of time. The period of closing should be longer than the period of opening. This should be regulated by the length of the primary closing strap.

The commutator straps *a b* should be of the same length as the primary strap. The straps *a' a' b'* should correspond in length with the primary open space. The speed at which it would be required to revolve the drum would depend upon the size and character of the induction coil.

The direct current thus produced would undoubtedly be undulatory in quality and probably intermittent. A condenser placed at *m n* might be expected to improve the quality of the current produced.

2. It is not in accordance with what is currently understood of electricity that it differs in nature and laws according to the particular type of battery from which it may be produced. Consequently, we should expect that in the case described the current from whichever cell it was started out to line would follow the laws of divided circuits and distribute itself over the various paths provided, irrespective of any corresponding quality in the several cells at the farther end.

But on looking more closely at the conditions described it will be seen that at the bell end there is a rather complex system of shunted circuits closed from a common point on one side to a common ground on the other. Here would be a circulation of currents which our correspondent has overlooked. However, as to the main proposition we think there would be no such distinction as he supposes.

The Electric Club Incorporated.

The Electric Club, of New York, which was organized about one year ago, has recently been incorporated, under the laws of the State governing such bodies. The names of the incorporators are as follows: H. C. Davis, Geo. W. Hebard, Thomas A. Edison, John B. Powell, Geo. L. Beetle, E. T. Lynch, jr., Charles W. Price, H. B. Thayer, A. J. Dam, H. C. Adams, H. D. Stanley, Clark B. Hotchkiss, Charles Dutton, M. W. Goodyear, John W. Beane, Hugh R. Garden, T. L. Fowler, Willard L. Candee, C. O. Baker, jr., and C. H. Barney.

The date of the incorporation is June 30, 1887.

A Celebrity Abroad.

Our esteemed contemporary, the London *Electrical Review*, says that "there is only one great man in France, and his name is Herz—Dr. Cornelius Herz, Grand Officer of the Legion of Honor, Officer of Public Instruction, and Correspondent of the Ministry of Public Instruction and Fine Arts of France. The greatest men are not always the best known, and it is possible that there are Frenchmen still alive whose names, even amongst our own readers, are more widely known and revered than that of Dr. Herz. Great men are proverbially modest, and, confident as they may be that they stand upon an altitude higher than that occupied by those around them, they invariably wait until others recognize their genius before uttering even a whispered intimation that they are not as other men. Thus, if their friends and intimates be undiscriminating, or envious of powers greater than their own, there is danger of the self-consuming genius descending to the grave unhonored and unsung, his best and noblest qualities never known or never acknowledged. Of course there is the chance of accident; and to accidents and fortunate happenings we owe much of the wisdom and many of the benefits which the world has derived from its most gifted offspring, for but for those accidents and happenings the minds of these benefactors of their fellow men would have remained undeveloped or would have been condemned to labor in ignoble paths. Whether it is to accident or to growing and gradual appreciation that Dr. Herz owes his present fame is to us unknown. But the discovery that he is a man among men seems to have been quite recently made. If we are to credit the gossip papers, the distinguished electrician has had many friends, men of note in the political world and leaders in the world of letters; yet none of these detected flowering genius in the 'robust, keen-eyed, broad-browed man' who was continually inviting them to witness interesting electrical experiments which seemed to lead—nowhere; or if they perceived it, they held their tongues, lest, perhaps, their own fires should pale and grow hopelessly ineffectual in the light of the new sun. To a correspondent of the *Times* belongs the honor either of being more discriminating than any of his fellows or more honest and outspoken on his friend's behalf. Backed by the immense influence of the organ which he represents in Paris, that gentleman has published to the whole world what was before known to comparatively few—the marvelous inventive faculty possessed by Dr. Cornelius Herz as exemplified in the production of—the micro-telephone push-button! With their usual perspicacity, the celebrity hunters and the men who seek 'the coming man' in the interests of the hebdomadal society papers, have followed the lead of the *Times* representative and have sought the hospitality of the Avenue Kléber. *Truth*, a week or so ago, waxed eloquent over the fact of the discovery of Boulanger, the most popular man in France, by Herz, the cleverest man in France; and now the *World* is adding its mite of panegyric to the art collector, the *savant*, and the man. Thus it will be seen that if newspaper eulogy can confer distinction, Dr. Herz is on the high road to that fame which is the coveted ambition of most men, great or small. A great deal comes to the man who watches and waits, and makes the most of opportune occasions; and this French-American scientist possesses in superabundance the qualities which assist destiny. He is a man of unbending energy and will, says the admiring *World*, also he possesses the prime quality of enthusiasm, which in any man goes far toward impressing others with faith in his abilities and in his undertaking. It is true that the man has been enthusiastic over several schemes which have been close approaches to failure; but these miscarriages have been made to look so much like partial successes that many people are altogether deceived as to the real character of the result.

"Herz believes in himself, we are told, and we are quite prepared to accept the statement as a correct proposition; he believes in his power to impress, to persuade, and to put the right color and construction upon any matter of doubtful import. In fact, he believes firmly in his own ability to be plausible. Another dictum from the same source we are a little more chary in accepting, namely, that he believes in everybody else. The attribute of such extreme simplicity is scarcely to be found in the traveled Parisian, who is at the same time the bustling American, alert and perceptive. Perhaps the reason why he is credited with such an abiding confidence in humanity is that he knows how to judiciously flatter the understanding of those with whom he comes in contact, by assuming an air of child-like faith and belief in the wisdom of the least significant utterance. This undoubtedly gives him power, for men are alarmingly prone to be gulled into the belief that they are oracles, and that their hearer never doubts that he is listening to the uttered thoughts of a great intellect. But the mystery is that, after the connection of Dr. Herz with so many exploits which have come to nothing, there should still be found ardent admirers of his genius. Those who were witnesses of his enthusiastic championship, years ago, of the Werdermann semi-incandescent lamp must ever since have been expecting a little revolution. Marvelous were the prophecies and promises emanating from the Yankee Frenchman, when he had to do with that invention; but the fantastic visions conjured up, as the certain outcome of this highly lauded scheme were never realized. Well do we remember how, on more than one occasion, we incurred the doctor's wrath, by venturing to question the practicability of the manifold ideas with which his fertile brain was teeming. But the event, in each instance, proved the justness of our criticisms; and we doubt if many people are richer, though many must be wiser, as a consequence of the "soft and suave" influences brought to bear upon their reasoning faculties by Dr. Cornelius Herz.

"More recently we have become accustomed to his strong advocacy of Marcel Deprez's power transmission schemes, which, again, were to take knowledge on a flowing tide, far, far above the previously existing high water level. But what have we seen? Notwithstanding the ungrudging support of the Rothschilds and the concomitant lavish expenditure of gold, we are pretty much where we were, and the only knowledge we have gained from Marcel Deprez's experiments is that a great deal of money may be spent to very little purpose—and even that many persons will fancy they knew before.

"Coming to the latest and most notable of Herz's wonderful discoveries, the *bouton telephone*, we have no hesitation in saying that, so far as the apparatus is concerned, there is but little of invention in it. Ten or twelve years ago telephones of a similar kind were constructed in the British Telegraph Manufactory; those little telephones were even more simple, inasmuch as transmitter and receiver were one and the same instrument, the microphone being absent. They were worked magnetically, that is to say, precisely as were the first Bell telephones. The motives of the *Times* correspondent and the interviewer of the *World* may be of the purest, but that those eminent journalists should have been so readily convinced of the greatness of the man and of the wonderful nature of his so-called invention, is but an instance of how gullible otherwise well-informed people are in regard to matters which are just beyond their ken."

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NEW YORK, JULY 16, 1887.

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The movement taken by Kansas University to offer a four years' course in electrical engineering will probably be followed by other institutions of high order, having scientific departments.

Dr. G. T. Jackson, in a paper on baldness, read before the New York County Medical Society, states that one of the causes is the effect of working under hot artificial light, such as gas or kerosene. We now know what is the cause of the baldness of those who frequent the front rows of the theater; the incandescent light in time will change all this.

A large number of our enterprising fellow men are asking loudly if it is not high time for a general uprising of Americans for self-protection against the hordes of vicious immigrants who hate our institutions, who are hostile to the idea of government, and who are a growing peril and menace to all that we hold most dear?

A committee of the Boston city government are to visit other cities in search of information upon underground electric wires. New York will be a point of much interest to them just now.

The Government wants to reduce the telephone rates charged the departments. Mr. Garland, no doubt, thinks his services entitle him to a free set. He has been very successful in unintentionally exposing the fraudulent character of the companies organized to break down the Bell patents.

Col. John B. Powell, general manager of the Brush-Swan Electric Light Company, of New England, returned from Europe on the Alaska, last Monday, greatly refreshed by his four weeks' vacation. A number of Col. Powell's Electric Club friends gave him a warm welcome on his arrival.

There are a great many electrical inquiries sent to the REVIEW office. Many of these are answered through the mails, and those of general interest through the columns of the REVIEW. Inquirers should not expect immediate answers always, but can feel assured of attention at the earliest moment that our space will permit.

Preparations for the August meeting of the National Electric Light Association are being made on an extensive scale. The demand for exhibition rooms has almost paralyzed the proprietors of the Parker House, Boston where the meeting is to be held. But as it comes off during the slack time in hotel business, all will no doubt be able to secure accommodations. The motor exhibit will be unusually large and interesting. Remember the date—August 9, 10 and 11, with a banquet on the evening of the last day.

There are a few water motors attached to the city or corporation service pipes and used to drive dynamos for electric lighting Where a plentiful supply of water at high pressure can be obtained and sold at low rates this furnishes one of the most convenient and desirable forms of small motive powers Let us consider the cost of one horse power delivered by an efficient (70 per cent.) motor in a city where the meter rates are as low as one cent per 100 gallons (exceptionally low for a large city). At a pressure of 45 pounds per square inch it would require about 3,500 gallons per hour at a cost of 35 cents. With a pressure of 90 pounds per square inch one-half as much water would be required, cost 17½ cents. At higher pressure the expense would be proportionately reduced. Fuel for small steam engines, whether kerosene or coal be used varies from three to five cents per hour per horse power. It will be apparent that the field for water motors to be used in electric lighting is confined to places where only a nominal price is charged for water.

In New England and some other sections of the country anthracite screenings are the cheapest fuel to be obtained. It is possible but not profitable to use the screenings alone; the loss of the fine fuel still unconsumed through the grate bars makes it more expensive than better grades of coal. The same or a somewhat less weight of soft or Cumberland coal is therefore mixed with it. The mixture slightly moistened when thrown on the fire rapidly cakes, and no more is lost through the grate bars than if all soft coal were used. The greater the proportion of screenings that can be burned and this result obtained, the greater the economy. Some firemen succeed in using one part of soft coal to three or four of screenings, while others have difficulty unless the proportion of one part of soft coal to one part screenings is adhered to. The difference lies in the care with which the mixing is done. The two are thrown separately on the fire or put in a weighing box or on the floor a pretence of mixing is made. When carefully mixed a large percentage of screenings in each can be easily burned and with high economy as regards the fuel account, for the cost of screenings is about one-half that of Cumberland coal.

DEATH OF EDITOR BAILEY.

Mr. Jackson Bailey, editor, and, with Horace B Miller, the founder of *American Machinist*, died Thursday of last week at his residence in Brooklyn. The funeral on the Sunday following was largely attended by members of the Press Club of this city, of which he was first vice-president. Mr. Bailey was also a member of the Electric Club, of New York, and a committee from the club was present at the funeral. Both organizations presented beautiful floral tributes to the memory of this most worthy man.

Mr. Bailey was but forty years of age. If we measure life, however, by good deeds done and vast and successful work in the literary field, his life was not a short one. No journalist in New York had more sincere friends, for he never broke a promise, and he was ever ready to extend a helping hand.

HOW TO FORM A PRIMARY BATTERY COMPANY.

Organize under the laws of the State of Maine; 10 000 shares of stock, par value, $100 per share. Offer to let in your friends on the ground floor, at $1 per share. Print some circulars, setting forth the millions [not] made in primary batteries, in times gone by; explain indefinitely that a new discovery has been made of an [old] chemical by the aid of which current can be produced for domestic incandescent lighting There are as gullible investors as ever were caught, and they will bite. Delays are convenient—carbons not ready; cups too porous. Keep this up as long as possible, and then get some batteries, and run one or two incandescent lights far above their candle power. Don't let them burn but a few moments at a time, and a 5 candle power run up to 25 candle power will last some days. Comment on the whiteness and steadiness of the light. When people apply for batteries, convince them of their folly, and induce them to purchase stock. When the enthusiasm is at its height, sell the stock, and be conveniently called to some other section of the world for a year. On returning, repeat the same operation.

A WISE AND LIBERAL MOVE.

The sensible policy of admitting its old and tried employes into full interest and representation in the business of the company has been adopted by the electrica house of E. S. Greeley & Co., of New York, and the new company has been incorporated under the name of "The E. S. Greeley Company," taking effect from July 1, 1887.

The reorganization is one that the proprietors have had in contemplation for some time, and is consummated without making any change whatever in the personnel of the management of the various departments, the capital employed, or the business policy of the old house.

Mr. E. S. Greeley retains a controlling interest, and will continue in the general management of the entire business.

Mr. Arthur Parker, for several years an associate in the firm, retains his former interest and the special direction of the southern sales department.

The following named gentlemen will continue to exercise the management of their respective departments as heretofore:

Mr. M. W. Goodyear, in charge of the electrical department.

Mr. Joseph Bailey, Western sales department.

Mr. E S. Riggs, home office of the railroad department.

Mr. J. W. Sands, in charge of the bookkeeping and cashier's department.

Mr. Goodyear, who is best known to the electrical fraternity, has been an indefatigable and earnest officer of the company for a number of years, and his efforts have been eminently successful in building up a very extensive electrical business. The REVIEW congratulates Gen. Greeley on the wise move he has made and on the energetic and loyal staff he has associated with him.

The Executive Committee of the National Telephone Association fixed the date of meeting at Pittsburgh for September 26th.

OUR CHICAGO LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

Parsons, Kansas, is putting in a Thomson-Houston system, and Chetopa, Kas., has contracted for a six hundred incandescent system, while Wichita, the "Wooing Witch of the Wild West," is to have four miles of electric railway in operation by the first of August. The system is a series circuit system, the invention of W. L. Selden, of St Louis, who is superintending the construction, under the Advance Electric Company, of St. Louis, contractors. The Witch has electricity on the brain. The gas company has a plant of 120 Thomson-Houston; the Archer Electric Manufacturing Company are putting in 2,000 Ft. Wayne Jenney incandescent; the Schuyler has over 200 arcs. The A. D. T. people claim to be doing well, and the Levens Electric Bell Company, as well as the Novelty and Electrical Works are down with the same disease.

The Archer Company, of Wichita, has the agency for the Ft. Wayne Jenney system for Kansas. Prof. Kammeyer, recently with the Electrical Supply Company, of Chicago, is the electrical standard-bearer for the company.

Coming nearer home, the Chicago Arc Light and Power Company, whose headquarters are at present in the saddle, so to speak, are arranging for a very complete central station in the Central Manufacturing block, on Market street and the river, between Madison and Washington.

The plant, when completed, will include thirteen boilers, with a total capacity of 1,500 horse power. There will be three 500-horse-power compound condensing engines, and three extras, of 75 to 200 horse power each. The dynamo capacity will be 2,000 arc lights. The area beneath the sidewalk, 148x25 feet, will be used as a coal receptacle. In four basements will be located the boilers, in a space 54x148; and the engine room will be 142x29. The dynamo room will contain 8,140 square feet of floor. The offices, which are well lighted and airy, will occupy 85x35 feet on the third floor.

The present scattered condition of the company's plants is extremely uncomfortable. The north side plant is a couple of miles up the lake, and the west side station is a mile towards the setting sun, while in the busy portion of the city there are two plants, nearly half a mile asunder. By and by, when these are concentrated under one roof and systematic supervision, the whole will be made far more convenient, comfortable and effective for both patrons and payees.

The electric lighting of the river came up in the Council on the 6th instant, as thus:

Ald. Clarke moved the passage of the ordinance for the electric lighting of the river, as previously recommended by the Committee on Fire and Water. He said the intention was merely to experiment at first between the points named, and if the lighting was satisfactory to go on putting in the plant, but keeping without the limits of the estimate submitted to the Council.

Ald. Wetherell said that no appropriation had been made that could be legally used for this purpose. He moved to amend so that the money be taken from the Gas, Police, Fire, and Fire Alarm Telegraph Departments, the amount not to exceed $15,000. Ald. Clarke said the expense would be about $10,000 to $12,000; the total expense for lighting the river and all its branches was estimated at $47,000. The amendment was carried. The ordinance is as follows:

"That the Commissioner of Public Works is hereby authorized and empowered to contract for the construction and maintenance of an electric light system within the limits of the city of Chicago, along and upon the Chicago River and its branches and the bridges, viaducts and ends of streets contiguous thereto, between Halsted street on the South Branch and Halsted street on the North Branch, and from those points to the mouth of the river. The Commissioner of Public Works shall designate the route or routes, streets, bridges, tunnels and viaducts in and through which said system shall be extended, and shall have full power to prescribe and enforce all lawful conditions and regulations as to the erection and maintenance thereof."

And the telephone ordinance, which, like Mahomet's coffin, has been so long suspended

between heaven and earth, was further postponed till 8.30 P.M., next regular meeting, for the City Law Department had failed to send in an opinion as to the legality of the ordinance.

The Sperry Electric Company, at Chicago, capital stock $250,000, was incorporated last week, for manufacturing, by Edward Goodman Jno. S. Marshall and Joseph R. Smith, and

The Kelly Insulating Company of Chicago was also incorporated, with a capital stock of $12,000 for the manufacture of paper insulation. George Kelly, Edward A. Mulford, and Chas. H. Stewart incorporators.

"Heavens to Betsy!" as Doctor G. might remark—but perhaps it's not electrical insulation, after all.

CHICAGO, July 11, 1887.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW)

Boston, far behind other large cities in the adoption of a police signal system, has for some time had the benefits of an experimental plant in the South Boston district. Its assistance in several disturbances has convinced the police commissioners of the desirability of equipping the entire city with the system. The city government do not directly control the expenditures of the police department, the commissioners being appointed by the Governor, and have opposed any expenditures for police alarm. A bill was passed by the last legislature which compels the city government to appropriate money for this purpose. The city auditor has been authorized by the city government to allow for payment the requisitions of the board of police drawn on account of the introduction and maintenance of an electric signal and telephone system.

The report of the fire commissioners pleads for an extension of the still alarm system. The bell system was more potent in drawing crowds than in warning the department.

The Mather Electric Light Company, through their New England agent, E. P. Sparrow, have completed a 100 light incandescent plant at the Richards Paper Company, and a 50 light plant at S. D. Warren & Co's., Gardiner, Me. An installation of a central at Houlton, Me., is in progress.

The Boston Electric Club have leased for club rooms the two upper stories at 66 Boylston street. Workmen are busily engaged in removing partitions, and an electric elevator will be installed. The rooms are amply lighted in the rear and in front which faces the common. The upper floor will be used as a billiard and chess room, the floor below as general meeting, reading and assembly room. A small office for the board of managers connects conveniently with this. Lavatories adjoin both rooms. The position is central and convenient, horse cars connect with the Northern and Southern depots, and every part of the city. The public library is a few doors away, and the Massachusetts Institute of Technology within easy walking distance.

Several successful trial trips have been made with car 54, Cambridge Railroad, equipped with Weston motor and Julien batteries, under the charge of electrician Stevens, and in a short time regular trips for passenger service will be made.

The Southbridge Electric Light Company, operating the Thomson Houston system, have ordered two Armington & Sims engines and tubular boiler set with Jarvis furnace, adapted to burn sawdust, a kind of fuel which can be obtained at little expense.

The Newton Electric Light and Power Company have ordered of the Jarvis Engineering Company a second Armington & Sims engine. The increased power is required for the Thomson-Houston alternating system. Any part of Newton can be easily reached by this system and a large amount of house lighting done.

The Bijou Theater are to introduce a novel attraction combining realistic, sympathetic and exhilarating effects. One of W. S. Hill's electric motors drives a blower, from this pipes leads to every part of the house, terminating at upper part of the back of each seat. Here is a valve and a discharge nozzle pointing backward. A movement of the valve and a stream of beach air is blown on the face of the spectator. Suitable tanks might be added to the paraphernalia of the theaters, and oxygen gas, nitrous oxide, etc., could be supplied for the production of realistic effects on the part of the audience.

A man hailing not many miles from Boston claims that he has produced an arc lamp in which the carbons increase in length and the inverse electromotive force is so great that a counter current charges storage batteries or runs motors. There was once a monster who had many a head grown in place of every one his enemies cut off It's the same to-day with those who want to outbid the law of the conservation of energy.

BOSTON, July 12.

ELECTRIC MOTORS ON THE ELEVATED ROADS.

The *Daily World*, of this city, expresses surprise in an article published in another column that an electric motor has not been tried on the elevated roads of this city. There is good reason for this apparent backwardness. The immense traffic and numerous mechanical difficulties would require unusual and special construction in the motor, and not many companies care to undertake the work. However, Mr. Stephen D. Field, an able and enterprising electrician, refused to be daunted by the difficulties of the undertaking, and within the next thirty days will probably have his electric motor, specially constructed for the work, ready for a thorough test on the elevated roads of this city.

BOOK REVIEW.

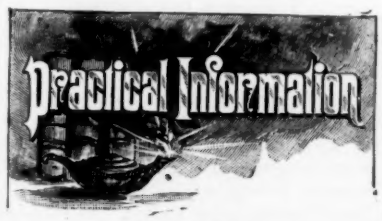
"Electric Light Primer: A simple and comprehensive Digest of all the most important facts connected with the running of the Dynamo and Electric Lights, with Precautions for Safety, etc. For the use of persons whose duty it is to look after the plant." Charles L. Levéy, New York.

Electrical engineering cannot be taught in one easy lesson, even by the help of this wonderful production. "Any substance, non-metallic, can be used for insulation, from paper up." What of lampblack, carbon and liquids?

"The voltmeter is 'about the same' as an ammeter. Without them the party in charge is in the dark, however brilliant the light may be. If a breakdown occurs he is often unable to detect the cause." A bobbin is defined as a coil of wire mounted so that it can be rapidly revolved. "It is a good plan to put the galvanometer in circuit daily, as it will detect any break that may occur."

The pamphlet will be of use to electric light men who wish to while away an hour, and have not at hand the last number of *Judge* or of *Puck*, or "Why We Laugh" or "How Not to Do It." Tables of the relative resistance and safe carrying power of copper wire and tables of the Edison Standard gauge are given in a convenient form for reference.

The directors of the late United Telephone Company, of the River Plate, now merged into the United River Plate Telephone Company, have handsomely manifested their appreciation of their manager, Mr. Adolph Fels, in a beautiful service of solid silver, just completed by the Gorham Company. The service consists of a pitcher, three drinking cups and salver, in exquisite workmanship, the former bearing an appropriate inscription. Mr. Fels is the manager of the new amalgamted Buenos Ayres company, the largest telephone company in South America. Mr. F. W. Jones, of the above company, and vice-president and general manager of the West Coast Telephone Company, who has been in New York for several weeks, sailed for Europe last Tuesday, on the Trove.



Queries and Answers.

To the Editor of Electrical Review:

DEAR SIR:—Will you please let me know in your "Queries and Answers":

1. Is German silver wire used for the magnetizing coil in voltmeters, and what size is generally used?

2. What sized German silver wire is used to take the current of a 16 candle power incandescent lamp in a cut-out for the broken lamp where they are run in multiple arc on a constant current circuit? Is not German silver wire always used? O. J.

Danville, Ill., July 1, 1887.

1. It is necessary to have the coils of a voltmeter of high resistance, first that the amount of current going through the coil may be small, and the difference of potential at the terminals not lowered; secondly, because the readings of the instrument would be changed if the coils became heated by a large current. German silver wire, on account of its high resistance, is generally used. The resistance of the coil varies from 1,000 to 10,000 or more ohms, according to the electromotive force to be measured.

2. Carbon, graphite, acidulated water have been tried. German silver wire about No. 30, Brown & Sharpe's gauge, is much used. It should be bare and wound on slate or any non-combustible insulator.

TESTING FEED WATER HEATERS.

To the Editor of Electrical Review:

Will you, or some one of your engineers, or expert readers, inform me, through the columns of your journal, the correct way to arrange a thermometer to get the heat of feed water after passing the heater?

Ans.—Do not let the pressure of the feed come on the bulb of the the thermometer, as that will make it read too high. Weld up the end of a short piece of $\frac{1}{2}$" or $\frac{3}{8}$" pipe, and insert it in a tee in the feed pipe. A little mercury in the pipe will get nearly as hot as the feed; a little waste will lessen cooling; the bulb will then be free from pressure and register but slightly below the feed temperature.

HARDENING COPPER.

To the Editor of Electrical Review:

Is there any way known of hardening copper? EGYPT.

Ans.—In one process claimed to do this, the ingredients of the hardening composition for 25 lbs. of copper are 1½ lbs. potash or soda; 1 lb alum; ¼ lb. bone dust or other phosphate; ¼ lb. zinc or tin. The copper is brought to a red heat in a crucible and the compound added. When the whole is melted the slag is removed and the melted metal covered with powdered charcoal.

SOME GENERAL QUERIES ANSWERED.

To the Editor of Electrical Review:

By answering questions I trust you will not only be benefiting myself, but other of your readers.

1. Suppose that we want to construct 50 magnets, which will have to attract their armatures strongly enough to lift or move a valve. How much resistance should we give each magnet, supposing the line wire or external resistance to be 10 or 15 ohms?

2. How many amperes would be required to operate these magnets, desiring to make the number of cells as low as possible?

3 How can I make an instrument for getting diagrams (or curves) of the degree of magnetization?

4. How many ohms resistance should I put in an ampere meter that I wish to make—one that, included in a telegraph circuit of any resistance, would indicate the number of amperes flowing? The same in regard to a voltmeter. ELECTRICS.

St. Louis, Mo., June 13, 1887.

1. If the magnets are connected in series, their combined resistance should equal that of the line and the batteries employed. If 100 cells of gravity are used, resistance of each 5 ohms, each coil should have a resistance of about 9 ohms. If 200 cells are used, each should have a resistance of 18 ohms.

If the magnets are to be connected in multiple arc (an uncommon arrangement under the circumstances) the resistance of the line wire would make any disposition of a sufficient number of battery cells exceedingly inefficient as regards consumption of battery material.

2. $\frac{1}{10}$ to $\frac{1}{4}$ ampere, according to the work to be done in lifting the valve, and the number of turns of wire on the coil.

3. Suspend from an ultimate silk fiber a magnet about $\frac{3}{8}$ inch long, loaded with sealing wax or any convenient substance. Lay the magnet on a sheet of paper. Place the suspended magnet in different position over the magnet, and always at the same distance above it (about $\frac{1}{4}$ inch) set swinging and count the number of vibrations per minute. Do this for various points on the rod. Square the number of vibrations found in each case. Draw lines at right angles to the magnet, starting from a position in which the suspended magnet was swung, making as many eighths, sixteenths or quarters of an inch in length as the square of the number of vibrations. The same distance for a vibration must be used for the entire magnet. Now connect the ends of the lines so drawn by a curved line which will represent the magnetism of the magnet at a distance at which the suspended magnet was held. Now repeat, holding the suspended magnet at various heights above the magnet and plot curves, using the same scales employed at first, and the magnetism in any position about the magnet can be estimated.

4. The resistance of an ammeter should be as low as possible—less than an ohm in this case. Enough turns of wire must be used to give a readable deflection for the smallest current you wish to measure.

A voltmeter must have a high resistance—1,000 ohms or more. German silver wire is more convenient to use, since it has about 13 times the resistance of copper wire of the same size.

A QUESTION FOR MR. EICKEMEYER.

To the Editor of Electrical Review:

If one pole of a magnet be inserted in a gramme ring armature, and the armature rotated, will any current be produced? On page 181 of Fiske's Electrical Engineering, such a machine is shown. Eickemeyer also claims to have produced a current with such a machine, as shown by Fig. 19 in his interesting and remarkable paper published in your issue of March 12 However, in my experiments I fail to generate any current by simply a continuous cutting of lines of force.

New York. ARMATURE.

HARD VS. SOFT.

To the Editor of Electrical Review:

In your issue of May 28, on the tenth page lower right-hand corner, in "Queries and Answers," you say: "When two substances not equally hard rub together, the softer wears rapidly away, while the harder suffers little loss." Is this true always? If so, why will the escapement wheel of a clock, which is made of soft brass, in time cut almost or quite through the escapement itself, which is of hardened steel? Why will the axle of wheels in watches in time wear entirely through the jewel bearing in which it runs, without any appreciable wear to itself, and the softer the steel in the axle the quicker the jewel will wear?

New York, May 27. W. C. T.

A harder metal wears away a softer. The exceptions to this statement are easily explained. In case one metal is very soft, like lead, fine particles of dust, emery, or the harder metal, in moving contact with the lead, may become imbedded in that. The harder metal is now worn away, not by the lead, but by the fine particles in the lead. The lapping out of holes in hardened steel, by lead rod on which emery is sprinkled, is familiar. In the same way the jewels of a watch are cut, not by the steel pivots, but by the fine particles of the jewel itself, imbedded in the end of the pivot.

Telephonic News

*** The Inter-Continental Telephone Company has declared its fifth quarterly dividend of 20 cents per share, payable July 1st, 1887.

*** E. T. Gilliland has returned from the West in excellent health and will soon be heard from again with something of interest to his friends in the electrical field.

*** The Mexican Central Telephone and Telegraph Company, the chief company operating in Mexico, has declared its regular semi-annual dividend of 2 cents, payable July 1st, 1887.

*** It seems incredible, when we consider the vast extension of the system of telegraphing, that the man who made much of the earliest machinery for Prof. Morse has just died. He was Mr. Daniel Davis, of Princeton, Mass.

*** A telephone company, known as the American National, has been incorporated to exploit the Banta patents. The instruments can be seen, it is said, at 26 Broadway, New York. The trustees are: Francis B. Thurber, Edward A. Quintard, William H. Starbuck, Granville P. Haws, W. S. Wallace, Walter M. Jackson, J. H. Johnston, H. P. Wells, W. A. Clark, C. H. Botsford, J. H. Schrimer, and James W. Banta.

*** It is said that a syndicate of capitalists have secured the right to introduce the telephone into China. They don't know what trouble they are bringing on themselves. In the Chinese language delicate shades of meaning are given to the same word by a very slight inflection of the voice, and it is doubtful if the telephone will register or convey these inflections. If, for instance, a Chinese merchant wanted to have a lunch sent to his place of business, and gave the appropriate order, "Wang-wang," through the telephone, it would very seriously disturb his equanimity if the telephone people thought he ordered a large and ferocious bull pup.

*** It is stated that Colonel Clowry, Vice-President of the Western Union Telegraph Company at Chicago, instructed Superintendent Frank Jaynes, of San Francisco, to allow extra pay for extra work fully two months previous to the time he actually granted it. Why this delay? Members of the craft in almost every State in the Union can recover in full their back extra pay, which the company would be compelled to settle upon application to any court. Recently a member of the craft who had worked considerable extra, for which he had not been paid, was discharged. He presented an itemized bill for extra work covering a period of four months. The superintendent thereupon offered to reinstate him. The offer was declined and the company made to pay for the extra service he had rendered.

*** An interview with a St. Louis telephone girl contains the following: "One of the most curious things arising from the use of the telephone is the development of the 'telephone ear.' At any lecture, where the speaker can be heard only with difficulty, it will be seen that every listener will turn the ear he uses at the telephone. This would seem to prove that the telephone quickens rather than dulls the hearing. Yet you tell a person the other ear is not good and he will get indignant. Here in the central office, where a single ear is on a constant strain, we do not notice that the other ear suffers from the disuse. Persons have an idea that the shock they get sometimes when they have the trumpet at their ear and the operator carelessly rings them up, injures the tympanum, because the ear buzzes for a moment or two. That may be so, but I have never heard of it being so in fact."

Telephonic Investigations.

By Nelson K. Cherrill.

At the meeting of the Society of Telegraph Engineers, on the 24th February last, the President asked that any members who were desirous of speaking should make their remarks as concisely as possible, the time for discussion being limited. As a stranger to the meetings of the society, I did not like, under these circumstances, to occupy the time of the meeting with the following remarks; but, having since committed them to paper, I am sending them, in case you think them worthy of separate publication:

If we form a loose contact between two pieces of carbon, the resistance of the arrangement is lessened by a pressure which tends to tighten the contact, and is increased by a removal of that pressure. I believe this fact has been known for a long time. In 1878 Prof. Hughes showed, by his discovery of the microphone, that a loose contact placed in a state of vibration would modify a current passing through it at the time, in a manner proportional to the vibrations; and I think I am right in saying that the conclusion was immediately arrived at that the "microphonic action" was due to variation in pressure.

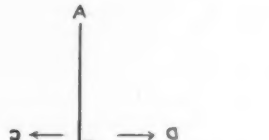


Fig. 1.

That this is the commonly received view is beyond question; that it is so is shown by the design of all the instruments in common use, and by the theoretical explanations offered by Prof. Silvanus Thompson. It is this view which I venture to combat; and I trust to be able to show that, although variation in pressure undoubtedly produces variation in the conductivity of the joint, this variation is independent of and has nothing to do with the telephonic action by which speech, music, etc., can be electrically conveyed.

The difficulty which presents itself, when we consider telephonic action as arising from variations in pressure, is that, on this assumption, we must admit that pressure must be, in some instances, both increased and diminished at the same time. Let me be quite explicit. Let A B (Fig. 1) represent the diaphragm of a Blake transmitter. There is a platinum point shown at P. The voice comes from the direction indicated by the arrow. Now, the implied explanation of the pressure theorists is that the waves of sound are "collected" by the diaphragm, and that the point P moves alternately in the direction C and D, increasing pressure as it moves towards C, and diminishing it as it moves towards D, the current being, of course, varied accordingly. This explanation is very simple when only a simple sound is given, such as the note of the tuning fork on the word "ah," etc.; but now suppose two sounds are given, the one being the octave of the two.

To produce the octave of any note the vibrations must be evidently twice as quick as those in the note itself; there must therefore be on the pressure theory twice as many increases of pressure in the one case as there are in the other. That is to say, the point P must, to produce the lower note, be at its extreme limit in the direction D at the same moment that to produce the higher note it is at its greatest distance in the direction C. In other words, the point P must be in two places at the same time, which is absurd; or, what is equally absurd, on the pressure theory, the current must, to produce a note and its octave, be both increased and diminished at the same time.

I know the common explanation of this and similar difficulties is that the movement of the point P is the resultant movement of all the sound waves on the diaphragm. So it no doubt is, but the "explanation" to me explains nothing.

If the current, as modified by the transmitter, is simply the "resultant" corresponding to the various pressures caused by the vibration of the diaphragm, how is the receiving instrument to know how to divide up the current so as to produce a like result at its end of the line? The idea seems to me much the same as if one should break up a column of type and send it in a box to a correspondent at a distant station. How is he to know how to recombine the letters so as to reproduce the ideas originally expressed by them?

Tyndall in his book on sound tells us that a resultant tone is a tone which corresponds to a rate of vibration equal to the difference of the rates of vibration of two primary tones, and he goes on to show that the resultant tone is always lower than either of the two primaries; hence, hearing a note and its octave in the telephone cannot be explained by any suggestion that the tones heard are "resultant tones."

It is sometimes suggested that as with a stretched string—as in a violin—not only the

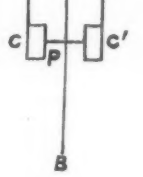


Fig. 2.

fundamental note is heard, but also many harmonica and over tones, with only one constant movement of excitation to keep up the vibration, so, somehow or another, one set of movements in the diaphragm will cause different tones to be heard in the receiver; but I cannot see that the cases are parallel in any degree. In support of the idea that pressure variation is not the cause of telephonic action, I made an experiment which is very interesting, if not quite conclusive. I removed the little spring carrying the platinum point from a Blake transmitter, and substituted for it a piece of platinum wire, which passes straight through the diaphragm, and is soldered to it; the wire terminates in a point at each end, about a quarter of an inch from the diaphragm. I then hung in front of the diaphragm a second block of carbon, making the pressure as nearly equal to the original block as I could. The arrangement is represented in Fig. 2, where C C' are the two carbon blocks, A B the diaphragm, and P the platinum wire between the two blocks, soldered to the diaphragm. I led the current from C through P to C', and thence to the transformer.

The object in this arrangement was to make the diaphragm vibrate between the two carbon blocks, so that if we were working by pressure the increased pressure on C' should occur at the same moment as a diminished pressure on C, and *vice versa*. I thought, if the pressure theory were correct, such an arrangement should not act telephonically, as the pressure and diminution of pressure should neutralize each other. To avoid any suspicion of C being driven on to the diaphragm by the same air waves that drove the diaphragm itself on to C', I conveyed the vibrations to the diaphragm by means of a wire which pressed against it at one end, and against the case of a small American clock at the other. With this arrangement I found I could detect no difference in the clearness with which the sounds were conveyed, whether the current was led from the diaphragm to C', as in the ordinary way, or from C to C' as described, and I thence conclude that as the pressures and diminutions of pressure between C and C' did not neutralized the currents they (the pressures) could not have been the immediate governing conditions of the current's strength. I am aware that this experiment is open to the criticism that to amount to a demonstration it would be necessary to show that the conditions on each side of the diaphragm are exactly alike in all points.

In making the actual experiment I put a contact key between C and P in such a manner that the one microphone could be short-circuited out of action without otherwise disturbing the arrangement. The sound in the receiver was louder when only one microphonic contact was at work, as would be expected, because so much less resistance would then be offered to the battery current (one cell of bichromate); but the sounds were equally distinct with the two contacts as with one. The scraping of the wheels, the clang of the spring, and all the host of sounds which go to make up the tick of a clock, were reproduced with equal clearness in either case.

There is another point, however, in favor of the view I am taking, which is, that with some at least of the commercial telephones, if the pressure theory is correct, the sibilant sounds ought to neutralize themselves. Mr. Preece tells us that the sibilant sounds go up to 4,000 or 5,000 vibrations in a second. The longest of these gives a wave length of .275 feet, or say about 3½ inches. The half of the wave length is evidently the distance between greatest and least pressure, so that any telephone transmitter having many microphonic contacts, may very well have some of them 1¾ distant from each other, and in such a case a sibilant tone of the above mentioned velocity ought to neutralize itself if it come in the direction of the line joining the two contacts. Practically, any transmitter of many contacts ought, on the pressure theory, to cause interferences, more or less, with the higher notes, according to the distances of the contacts from one another and the direction of the sound waves. I have not heard of the case of any such interferences having been actually observed, though Prof. Silvanus Thompson seemed anxious to provide against them when he stated in describing his transmitter of 108 microphones that "The impulses do not, of course, pass down the steel rod absolutely instantaneously, but the retardation of phase of even the shrillest of vocal sounds is quite negligibly small."

But is not the instrument devised by Prof. Silvanus Thompson himself, the "Valve," or ball transmitter, one of the best means of refuting the doctrine that telephonic action depends on variation of pressure? In describing the instrument Prof. Thompson says: "The loudness of the valve telephone is limited by the fact that it is not expedient to work with more than three contact points, the limit being a natural geometrical one," by which, I take it, he means that a spherical surface will rest naturally with equal pressure on three points, and that it is extremely difficult, if not impossible, to make it rest on more points with equal pressure on all of them. It is obvious that the pressure on the three points will be, roughly speaking, equal when the instrument is at rest, but as soon as spoken into, the case becomes widely different. Prof. Thompson, in his explanation, says the ball or valve "rides on the vibrations of the air waves." That may be so, but it can hardly be pretended that the valve, whilst so "riding on the vibrations," maintains an equality of pressure on all its supporting points. It would appear that the very idea of "riding on a vibration" involves lateral as well as vertical movements, and, if so, the pressures in the supporting point would be constantly varying; and, moreover, the ball would be approaching some of the contacts at the same time that it was receding from others of them. If, then, microphonic action is due to pressure, the valve telephone as described would produce sometimes one, sometimes two, and some imes three distinct and separate interpretations of the same note, depending on the phase of

vibration which the ball happened to occupy with regard to its three supports. As this is not the case, I think we may again conclude that telephonic action does not depend on variation in pressure, inasmuch as with the valve telephone vibrations of the same values are transmitted through contacts of obviously various pressures.

The very curious and interesting observation given by Mr. Stroh, in which he found the timbre of the sound transmitted by a microphone was altered by the adjustment, admits, I think, of another explanation than that put upon it by that gentleman. He finds the first contact of the two carbons is generally followed by a burning, which is, no doubt, the removal of the rough excrescences of the carbons by the heat developed in them by the current. If after this burning it happens that the carbons touch over a sufficiently large area, the current will pass silently and without any undue development of heat; but it is also easy to see that if the carbons happen to meet, say on the top of a little nodule, this may get very hot in carrying the current (though perhaps not hot enough to harm); the heat produced may by longitudinal expansion throw off the other carbon, if, as is explained by Mr. Stroh, the adjustment is very delicate, and this action would produce a rocking motion in the same sort of way as in Tyndall's explanation of the Trevelyan rocker, which would continue till either the adjustment of the spring was altered or until the constant hammering enlarged the surface area of contact to that point at which the current would pass without giving heat enough to produce the effect. If this line of reasoning be correct it is obvious that the area over which actual contact is made in a microphone may be a very variable amount, and it is further obvious that with a given pressure a variation in the area of the contact will give a corresponding variation in the actual current sent through the instrument. The sounds transmitted by the microphone are heard through the current, and whether the current is large or small (comparatively) the microphone differentiates all the parts of the sound, but, according to some experiments I have made, the timbre of the sound heard in the receiver varies with the amount of current passing, and hence the explanation of the phenomenon alluded to by Mr. Stroh.

Royalty at the Telephone.

The annexation of Belgium to France or Germany, as the result of a continental war, has often been spoken of as probable, but who could have imagined that Belgium was one day to be annexing France, and that without firing a single shot? Yet, morally, this is the phenomenon that is ripening; the telephone is doing it.

Two months and a half have now elapsed since the two countries startled the rest of Europe by connecting themselves through the telephone over a distance of 225 miles. England, especially, stared. She has declined often enough to be linked with France by a submarine tunnel, and Lord Wolseley wondered that Belgians should be such simpletons as to expose themselves to the invasion of a French army riding, or rather gliding, on the aerial telephone wires. Sneers and black-hued prophecies did not, however, deter Paris and Brussels from their project of telephonic union. Little Belgium was the first of continental cities to adopt Stephenson's invention; it swore it would be the first to use Edison's, as a means of international intercourse, and France being "willin'"—as Mr. Barkis would express it—nothing was to thwart such a desire.

On February 3d of the present year, a date to be remembered by historians, the telephone was ready to work experimentally between the Belgium and French capitals, and King Leopold determined upon having recourse to it to interview President Grevy. He requested the latter to have his ears open at the Elysee, at 3 P. M., while His Majesty himself would go to the Brussels Stock Exchange, which is the terminus of the international telephone on the Belgian side. The appointment was kept, and the advantages of the telephonic union immediately became obvious.

In the first place, the meeting between the two heads of States took place without any of the fastidious pageantry which such occasions impose upon unfortunate rulers when they meet face to face. King Leopold dispensed with all kinds of retinue and state carriages to go and confer with the French President; indeed, he spoke in the undress uniform he had been wearing at home all the morning; and as to M. Grevy, he is said to have been clad in his dressing gown and slippers during his talk with the King of the Belgians and sovereign of the Congo Free State.

The beginning which the Paris-Brussels telephone made, when it was opened to the public, 23 days later, caused many superstitious folks to turn pale. For, strange to say, the first communication which the wires conveyed was the news of a terrible calamity, the earthquake in the south of France and the Riviera, by which so many thousands of houses were wrecked, and so many hundreds of lives lost. However, outsiders only looked upon the circumstances as ominous. The greater number of people using the international telephone so far are stock brokers and journalists, a set of practical persons whose minds are generally pretty free from superstitition, and who are too busy to be given to disagreeable broodings. So the telephone has escaped the fate of those messengers who, when they bore evil news to the Eastern potentates, had their unlucky heads chopped off, for the trouble they gave. Far from suffering any punishment, the Franco-Belgian telephone is increasing its popularity every day, in Belgium at least.

One of its first effects has been to give an extraordinary impulse to gambling on the Stock Exchange. Of course, the quotations have at all times been swayed to a great extent by the prices of the Paris Bourse. Now that the telephone records the fluctuations of the French funds almost every minute, you may conceive the advantage which all stock brokers and bankers availing themselves of this means of communication, are able to secure in their dealings. It is just as though a certain number of betting men in New York were kept posted every half second as to the movements of the competitors for the Epsom Derby, while the Derby was being run. Brussels' gamblers now follow the quotation race on the Paris Bourse, yard per yard, inch per inch.

On journalistic enterprise this international telephone exercises a perhaps greater influence still. In order to grasp the facts, we must first bear in mind that competition of all kinds, financial, commercial, or literary, is invariably very much keener in small places than in large ones. In his description of an election day at Eatonswill, Charles Dickens shows that political feeling ran very much higher in that nutshell of a town than in huge London.

So it may be said that the race for money, for success, for news, is very much livelier in Brussels than in London or Paris. The promptness with which the Belgian capital availed itself of the inland telephone is a case in point. At the present hour the number of persons using the telephone in Paris is above 5,000; it is the same in London, and 1,500 in Brussels. Of course these figures will appear ridiculously small in such a progress hunting part of the world as America. I have read somewhere of there being 380,000 telephones at work throughout the United States, and that the citizens of Guayaquil, in Ecuador, have completed their telephonic communications before thinking of paving their streets. But then we are not concerned at present with the New World.

To return to journalism it may be said that the eagerness with which newspaper proprietors bid for popular favor is greater in Brussels than in any of the large continental cities. Whereas, the Paris or London daily is content with one edition per day, morning or evening, the smallest newspaper in Brussels issues at least two, and sometimes three or four editions per day, not to mention the additional "specials" published on extraordinary occasions: when a great sovereign disappears, or important elections are taking place, or a sensational trial, such as the Peltzer or Vandersmissen case, is going on.

In the morning, the Belgian journals, after traveling six hours by railroad, reach Paris with as full and as late a report of the preceding day's doings in France as appears at the same time in the *Figaro*, the *Siecle*, or the *Deba's*. Recently the Parisians, unable to be present in the flesh at Leconte de Lisle's reception as a member of the Academy, only enjoyed the perusal of the poet's speech and Alexander Dumas' reply on the following morn, when the citizens of Brussels already knew the two discourses by heart. The result of the Paris-Brussels telephone is, in fact, that, to get at French news early, a Frenchman should cross the frontier and take up his abode in Belgium. And this explains my opening phrase, "Belgium, without firing a shot, is annexing France, morally."

BRUSSELS, May 10.

Telegraphy in Dakota.

A man from the East was visiting a friend in a Dakota town. One day he came into his friend's office and said:

"I got a telegram about a half-hour ago and have been studying on it ever since, but can't make anything out of it. I'm afraid some of my family are sick."

"Is it the first one they brought to you?" asked his friend.

"Yes."

"Oh, well, it isn't intended for you then—they never strike it right the first time Let me see it."

He took it and read as follows:

MPSUS, June 8—J. Z. Grom: Del clsd by 12 hurrd bro quuuaurst conne tunnorrwb.

CODDOW & C.

"That's it," continued his friend; "this is intended for Graham, the lawyer. It means for him to go ahead and buy some land for $1,200, and that the man who wants it will be here to-morrow. That's easy to read compared with most of them. Let's go over and give it to Graham and then hunt up your message—it has probably been delivered around town somewhere."

A Smart Traveling Man.

"That'll be thirty-five cents," said the telegraph operator to the traveling man who had just sent a message.

"Do you want it right away?"

"Certainly. Cash is the rule here. Didn't you know that?"

"Can't say I did. It has always been my impression that telegraph messages went through on tick."

The President at the Telephone.

The President sometimes, out of office hours, wanders through the cabinet room and Col. Lamont's office into the penetralia of books and papers where Mr. Prudens keeps account of all the presidential appointments. The other day while in there the telephone bell rang. The President took down the instrument and answered the call. Somewhat to his surprise, he heard the voice at the other end say, "Hello, Prudy, you old sucker. Is that you? I can tell by the clove on your breath. How about those commissions?" Capt. John James Sylvester Hassler, the Appointment Clerk of the Interior Department, was closing his day's work and wanted a batch of commissions sent over to him. After explanations Capt. Hassler determined never to use a telephone hereafter without getting the countersign from Prudens.

.... Five years ago there was not an electric railway in practical operation in the country, while to-day there are more than a dozen, with every prospect that there will be a hundred within the next two years. Experts do not hesitate to predict the speedy displacement of the horse as a motor for cars in cities, and one authority believes that the change from horses to electricity will soon go on as fast as the electric plants can be manufactured. Step by step the dynamo has been so improved that the work which it costs $10 to do with horses can be done by electricity for $6. Even if electricity were no cheaper than horses, the change would be for the better.

TELEGRAPHIC

.... The Pittsburgh Electric Motor Company, Pittsburgh, Pa., has been incorporated. Capital stock, $100,000. W. McCandless, incorporator.

.... It is reported that the Tropical American Telephone Company will resume its semi-annual dividends of 10 cents per share July 15th 1887.

.... The Pacific Mutual Telegraph Company, of Kansas City, Mo., has decided to build to Denver and Omaha. This will be an opposition line to the Western Union and is strongly backed by Western capital.

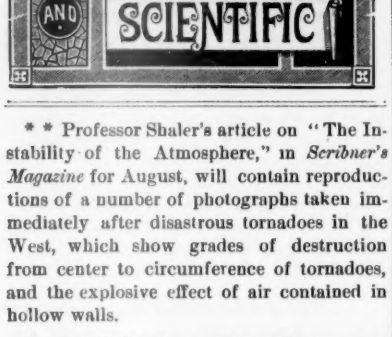
.... Bills which have passed the New Hampshire Legislature are the following: Act to incorporate the White Mountain Telephone Company; act to amend an act to incorporate Dover Gas Light Company; act in amendment of an act to incorporate Keene Gas Light Company.

.... The Riverside and Arlington Electric Railway Company has been incorporated at Riverside, Cal., with a capital stock of $500,000, to build twelve and one-half miles of road in one line, and additional branches as they are needed. The Board of Directors chosen are: Matthew Gage, S. C. Evans, James Bettner, A. S. White, Thomas Bakewell, W. J. J. Jarvis, and G. O. Newman.

....A young woman of Beaver Falls, Pa., is so charged with electricity that a hairpin which she wore in her head all day was magnetized enough to hold sixty-nine needles by their points. When the young woman's hair is stroked in the dark it emits sparks, and to touch her is to receive a shock as from a magnetic battery.

....A meeting of the Beattie Battery Zinc and Electrical Company was held in Fall River, Wednesday, to perfect the organization, and to make preparations for the manufacture of zinc as soon as possible. D. H. Chapin, of Fall River, was elected president, and A. E. Bosworth treasurer. The capital stock is $1,000,000, divided into 100,000 shares, at a par value of $10 a share. Fifty thousand shares are to be held by Mr. Beattie and those associated with him, which secures to Fall River the location of the enterprise; 25,000 shares are to go into the treasury, and the remaining number were placed upon the market. Forty thousand dollars was paid for the patent, with certain interests in its manufacture.

.... The Baltimore and Ohio is trying to reorganize their business in Brooklyn. Mr. Rochford, who was manager of the Postal and Baltimore and Ohio companies, combined, was summarily relieved from further duty for the Baltimore and Ohio on June 1, because the company decided to open offices of its own in the City of Churches. On Decoration Day the Baltimore and Ohio, without permission from the Electrical Commission, strung a wire to the Eastern District. When Commissioner Plympton learned that his official position had been ignored, he ordered the removal of the wire. The Baltimore and Ohio opened one or two offices adjacent to the bridge, where the cable could be tapped conveniently. These offices, it appears, handled business for the uptown districts, which was in consequence considerably delayed. Both the Postal and the Baltimore and Ohio companies have earned a small revenue in Brooklyn under the combination management of Mr. Rochford. Now that a division has occurred, the Baltimore and Ohio is left without offices, while the entire expense of maintaining some twenty branches is thrown on the Postal. Opposition companies heretofore have considered Brooklyn a decided drawback, but offices had to be kept open even at an immense loss.



* * Professor Shaler's article on "The Instability of the Atmosphere," in *Scribner's Magazine* for August, will contain reproductions of a number of photographs taken immediately after disastrous tornadoes in the West, which show grades of destruction from center to circumference of tornadoes, and the explosive effect of air contained in hollow walls.

* * The following-named gentlemen were elected members of the Executive Committee of the Boston Electric Club, at its last regular meeting: C. M. Ransom, B. S. Flanders, F. H. Sawyer, Thos. Roche, John D. Gould, A. F. Upton, William Brophy, S. E Barton, A. F. Mason, W. J. Denver, C. W. Woodworth, E. W. Rice, jr., C. J. H. Woodbury, W. I. Barker, F. M. Gilley.

* * President D. James Winn, of the Sumter Cotton Mills, Sumter, S. C., is corresponding with various houses for the purpose of arranging for the erection of an electric light plant at the factory. It is reported that the Atlantic Coast Line authorities intend running a line from the plant at the mills, and using the electric light in their warehouses and new depot.

* * Articles of incorporation were filed last week at Albany and Lockport, N. Y., by the Eastern Electrical Manufacturing Company, of Wheatfield, N. Y., with headquarters at Tonawanda. Among the trustees and officers of the company appear the names of Philip W. Scribner, president; James S. Thompson, vice-president; James H. Rand, treasurer, of Tonawanda; and Walton Smith, secretary; Claude C. Gould, general superintendent, of Batavia. The company own and control the patents, both American and foreign, of Messrs. Gould and Smith for their automatic telephone switch systems and a number of other new and useful telephone appliances. It is the intention of the company to at once place all of their inventions before the public. They have already placed one of their switchboards in practical operation at Mexico, N. Y.

* * Among the regulations recently issued by the Belgian Postal and Telegraphic Administration for the construction of electric lighting circuits, it is strictly prohibited to make any connections with gas or water pipes. Wherever the lighting conductors cross telegraph or telephone wires, they shall pass underneath the latter at right angles, and at a minimum distance from them of two meters (6½ feet) and, moreover, shall be protected above by a strong wire, to prevent contact in case of the breakage of the telephone wires. Electric light conductors shall not run parallel with telephone or telegraph wires if it can be avoided, but, where necessary, the distance between them shall be at least 12 meters (39.3 feet). The installation must be tested regularly, at least once daily. The contractor shall assume the entire responsibility for all damage or accident arising from his electric light installations.

* * An International Exhibition is to be held at Glasgow during the summer of 1888. The guarantee fund already exceeds £240,000, and is being increased. The objects of the Exhibition, as stated in the prospectus, are "to promote and foster industry, science, and art, by inciting the inventive genius of our people to still further development in arts and manufactures; and to stimulate commercial enterprise by inviting all nations to exhibit their products, both in the raw and finished state." Examples of the manufactures of Glasgow and the surrounding districts—chemical, iron, and other products, engineering, shipbuilding, electrical and scientific appliances, and textile fabrics—will be shown; and similar and more varied exhibits may be expected from other parts of Great Britain and from the Continent. Promises of support have also been received from America, India, the Canadian Australian, Cape, and other colonies. The site, which has been granted by the Glasgow Corporation, extends to sixty acres, and the buildings will cover about ten acres.

* * About three months ago a plant of the American system of electric lighting was shipped to Gottenburg, Sweden, where it has given such perfect satisfaction that an additional plant has been ordered from the American Company in New York, which was shipped last week.

* * Nyack, Upper Nyack and South Nyack, N. Y., with visitors from various points, and a notable representation from Haverstraw, celebrated with gusto the introduction of electric light. The main features of the occasion were the parade and the celebration at the Tappan Zee House. The parade passed through the principal streets and was witnessed by thousands. The houses along the line of march were brilliantly illuminated, and for two hours the sky was lighted up with fireworks in all directions. At the Tappan Zee House a collation was given to the village board and other guests by the Nyack Electric Light and Power Company, of which Clarence Lexow is president. The grounds of the hotel were illuminated with electric lights, and the parade passed in review before the stand erected there. The lights throughout the village work well and are more highly appreciated because of previous lack of lights in the sister Nyack.

A Writing Telephone.

According to a contemporary, a writing telephone appears to be the latest electrical novelty. It hails from Munich, and its inventors claim that the words of the speaker are duly written down by the apparatus, as they are spoken. Such a telephone as that is much wanted. According to an American paper, Mr. Tainter, who has long been associated with Prof. Alex. Graham Bell, of telephone fame, has taken up Edison's phonograph at the point where he left it, and developed it from a toy to an article of commercial value. Before long, the new instrument will be placed upon the market. It is constructed on the same principle as the phonograph; but instead of giving out a squeaking metallic sound, as when the sheet of tinfoil was used, it now produces a full, sonorous sound, which can be distinctly heard and understood in any part of an ordinary room. The conversation is recorded upon thin sheets of wax, in shape of a tube, placed upon a cylinder. One of these little tubes will hold 1,000 words. A merchant who has forty letters to answer can sit before one of these machines, turn the crank, and talk his answers directly into the machine, which records them upon the wax tube, in the same manner as in the old phonograph. Afterwards one of these little tubes can be slipped off the cylinder, and sent by mail to any part of the country. When received, it will only be necessary to put the wax tube into a similar machine, and it will reproduce the words of the original speaker, as often as may be wished. The thin wax tubes will be on sale at stationery stores, at about the same rate as letter paper.

* * Mr. Gorham Gray writes of the project of telephone communication between this country and Europe: "Telephoning through a wire being only and simply a wave of reproduction similar to an air wave or sound, or I might say a wave of the ocean, is perfectly practical for three million miles, and in fact more so under water than aerial, for disturbances atmospheric do not occur under water, nor do disturbances occur at a depth below a given sounding distance below the surface of the water, as the water at that depth is at rest. The small steel wire which I already have used for four years under water is a perfect reproducer, and will reproduce three million miles far better than the one hundred miles now so long in my service, and giving clear reproduction of conversation, and without any induction whatever."

*** The Mexican Central Telephone and Telegraph Company, the chief company operating in Mexico, has declared its regular semi-annual dividend of 2 cents, payable July 1st, 1887.

New York Linemen Said to be the Foremost Prevaricators in all the World.

"The public are way off when they think that the weather clerk is the champion liar of the world," said a keen-eyed and intelligent man with a kit of tools in his hand who had just been chased from an east-side tenement by an angry woman armed with a broom and a kettle of hot water. "I am quite sure that I can outlie the weather clerk any day, and there are several hundred men in the city who are just as proficient."

"Will you tell me where this remarkable band of men are to found?" asked an *Evening Sun* reporter.

"On the housetops."

"Do they go there to lie?"

"No. They lie to go there."

"What do they do when they get there?"

"Oh, they string telegraph, telephone, electric light, and all other kinds of wires. I am a lineman, and the men I speak of are all in the same business. I will tell you all about it if you will promise to make the public understand that we are not morally or legally responsible for the lies we tell. The high-toned officers of the companies we serve are responsible. I never told more than a dozen lies in my life until I became a lineman. Last year I figured out that I averaged $5\frac{64}{365}$ whoppers per day. How did I do it? Well, I kept count of all the fibs, fancy and plain lies, and whoppers that I told. Here is my memorandum. According to our arithmetic it takes ten fibs to make one plain lie, ten plain lies to make one fancy lie, and ten fancy lies to make one whopper. My report for last year is here:

Schedule of Mendacity from Jan. 1, 12.01 A.M., to Dec. 31, midnight.

Whoppers (straight)		1,806
Plain lies	733; reduced to whoppers.	73 3-10
Fancy lies	810; reduced to whoppers.	8 1-10
Fibs	3,640; reduced to whoppers.	3 6-10
Grand total of whoppers		1,891

Average per day, 5 66-365.

"That was the way I prepared the schedule on New Year's Day, but I don't mind telling you that the habit of lying was so strong in me that I actually could not set down the truthful result of my figuring. But the total is right within a few fractions, and half the people who study the problem will not be able to figure any closer to the correct results.

"Let me explain," continued the lineman. "If I should through force of habit tell an incidental lie, you mustn't be hard on me. The reason why we lie is this: You see the boss lineman will give a gang of us—that's three men—a memorandum of an address and a coil of wire, and tell us to put a telephone, or telegraph wire, or an electric light wire, on a particular house. Now, the nearest connection is sometimes a mile away, and how do you suppose we are to get to the desired house with the wires? Well, we must lie to get there—pure, simple lying fills the bill. We have no right to make a telephone out of a man's house; but we do it every time, with or without his consent. Now, if we went to a man or woman and said that we wanted to fasten a wire to his or her house, they would object every time. But we sometimes tell them that we want to 'pass a wire over the house,' and assure them that it will not touch their property. That is a fib. If we are met with objections, we go to some other house on the same block and say that we are mending a neighbor's roof, and that his traps are sealed. We get upon the roof quite often by this scheme, which we call a fancy lie. The plain lie is also pretty effective. This is when we go to a house and say that a wire charged with electricity, and passing over the roof, has broken and fallen. We always insinuate that there is danger it will set fire to the house; and it is a mighty sharp woman or man who can stand us off after that. When we are in a hurry, we simply walk up to a house and say that we have been ordered by the owner to put in a district messenger box for the occupant, free of charge. That whopper settles it nine times out of ten. I never saw a woman refuse to get something for nothing. After we have run the wire over the house, we come down and say that we can't finish until the next day. We never make more than one attempt on one house. In the first place, it would arouse suspicion, and in the second place it doesn't make any difference to us what house we get on in any block. Once on a roof, we can run all over the block; and I have many a time put a wire on the house of a woman who had refused to let me up. Most of these women don't know to this day that I got ahead of them.

"The funny thing about the trouble we have is that the people in the fashionable districts do not kick half so much about the wires as the people in the tenement house districts. Thus a fib will suffice in Fifth avenue, a fancy lie on any of the up-town cross streets, and a plain lie in most of the east side streets. But go into Baxter street or Mulberry street, and it takes a whopper every time to get us on the roof. I suppose the poorer the people are, the more they stand on their rights and dignity.

"A great deal of our time is spent in repairing wires that some one has cut because we used his housetop. Most of this trouble is in the tenement districts, too. You see the poor man has nothing to lose by cutting the wire; but the rich man fears a damage suit or a scandal, and he first makes complaint, and we remove the wire. We always tell people who threaten to cut wires that the electricity will kill them, as soon as the hatchet or axe comes in contact with the wire. That settles it in some cases. But we often run across people who know better. That woman who chased me out of that house just now is the wife of a lineman, it seems, and she went for me just as soon as I gave her the old gag."

"Have you the legal right to put wires where you please?" asked the reporter.

"Of course we have," said the lineman, with magnificent contempt. He was turning away, when a thought struck him, and he said:

"See here; if you won't lay up trouble for me by publishing it, I don't mind saying that's a lie, and that we have no right to put up the wires."

How Edison Fooled the Sailor.

Aqueduct Commissioner Ridgeway, of New York, has been spending a few days at Bellport, Long Island, where his plump face got well burned in boating. Chatting about his experiences at Bellport, he said: "I presume you have noticed the reports about the balloon that Edison sends up nightly from Llewellyn Park to the height of four or five thousand feet, attached to a wire over which he sends a current of electricity, and produces a brilliant star in the heavens. Although Bellport is eighty miles from the Park, Edison's balloon light could be plainly seen at night. I pointed it out to an old fisherman one evening and asked him what star it was. He replied very promptly that it was the North Star. When I disputed him he said he knew better, because he had been steering his boat by it for weeks. I offered to bet him four bottles of beer that he was mistaken and told him if he would watch the star until 10 o'clock he would see it disappear. I remembered having seen that Edison pulls his balloon down every night at that hour. The old fellow accepted my bet and planted himself on the porch of the village hotel to watch the star. Sure enough, at 10 o'clock down it went. 'By gosh' he said, 'who would have thought it? I have been a steerin' my boat by that 'ere star for months.' The old fellow was so excited over it that I paid the bet with good grace, although I had won it."

Telephone Rates to the Government.

The contract for the use of the telephones at the White House and in the Government offices expired on the 1st inst., and the President, after consulting with members of his Cabinet, has decided not to renew the contract unless at a reduced rate. The present rate is $100 a year for each telephone. Letters have been addressed to the telephone company from the heads of the several departments stating that they would order the telephones out of the departments unless the company reduced the price to $80 a year. An officer of the telephone company said that they had no idea of reducing the rate to the Government, and would prefer to have their telephones removed rather than do so.

A Decidedly New Battery.

In these days of bluster and extravagant claims for all sorts of electrical apparatus and generators, the advent of something new is naturally looked upon with warrantable suspicion; and the honest, fair-minded inventor who has brought to the front an article or a process which will bear the test of criticism and daily use, something really valuable for some specific purpose, is in danger of being misjudged.

There has just appeared upon the market a form of electrical battery which is novel in several important particulars; and these are such radical departures from ancient methods as to make a brief description interesting even to the general reader.

The battery in question is the invention of Dr. C. Piper, of Moline, Illinois, and is the outcome of necessities which that gentleman found in his daily round of practice. He wanted a battery which could be carried under the arm or in the pocket, in a dry condition, and of about thirty volts E.M.F., suitable for all ordinary cases in practice. How completely these points have been covered will be readily seen from the description.

Fig. 1 is a representation of the box open for use.

A, battery; *B*, tightening screw; *C*, box for chemical paper; *D*, the electro-magnet; *E E*, terminals; *f f*, contacts; *G*, sliding tube for varying the effect on the patient.

In a neat little flat 5½x9 inches and only 2¼ in height, the doctor puts a combination of twenty cells, shown at *A*. The cells are peculiar, both in form and method of connecting up. There are no wires or binding screws. Each cell, 1¼x1½x⅝ inches, being composed of a zinc and a carbon plate, separated by a cement on the sides and bottom in such a manner as to leave space for the solution. The cell is shown in Fig. 2. Each cell is connected to its neighbor by a contact the entire size of the plate, the whole firmly pressed together by the screw *B*. A dropping tube, *H*, is used for filling the cell with water after the chemical paper slip is introduced into it.

These paper slips are contained in the box *C*, and are the proper size for the purpose. They are covered with a crystallized salt of mercuric and potassic nitrate. One of these having been placed in each cell, water is carefully dropped into the cell, filling—not overflowing it—to near the top. Great care must be taken to prevent any moisture getting between the cells. When the cells are all so arranged the battery is ready for operation, and with it no less than four different currents may be made available. The continuous galvanic, the interrupted galvanic, the Faradic, and the combined galvanic and Faradic.

The use of a chemical salt as an electrolyte, which is rich in nitric acid, prevents polarization, as the hydrogen liberated by electrolysis is at once oxydized by the oxygen of the electrolyte. This electrolyte being uniformly spread upon the paper slip, presents to each surface an equal amount of chemical exposure, and thus insures uniformity in the action upon the plates. Gravity cannot so readily concentrate the salt at the bottom of the cell, and thus cause unevenness of resistance and consequent irregular flow of current.

The positive constancy of the Piper battery is one of its chief recommendations. A single cell placed on a short circuit through a galvanometer coil, measuring 800 ohms, deflected the needle 75 degrees when fresh, and having remained in that condition for 24 hours, the needle only showed a falling off of 1 degree. Its electromotive force is 1.65 volts per cell, and being newly set up at each exhibit, the certainty of its action is always assured, while its simplicity of construction and ease of handling are such that no fear need be entertained by the physician using it—and who has better occupation for his thoughts—that something may happen to defeat his best endeavors and render his battery useless until he can make a trip to town.

In addition to the medical form, Dr. Piper constructs a form of case for electrical testing purposes for electric light people and others. These are put up in combinations of 20, 40 and 60 cells, and will be more compact as well as more convenient than the silver chloride, which just now stands high for such uses. The medical battery weighs complete 3½ pounds, and the galvanic combination about 2 pounds, in each case a battery of 20 cells.

The Electrical Supply Company, at Chicago, are the authorized agents for the Piper battery, and will cheerfully furnish all needed information.

Useful and Interesting Application of Statical Electricity.

On the evening of the ladies' soiree of the Royal Society, and also at the Friday evening meeting of the Royal Institution, Mr. Wimshurst exhibited an exceedingly interesting experiment showing that small type placed upon a disk and revolved several thousand times a minute could, while in motion, be seen and read distinctly.

This was done by having a commutator arrangement attached to and revolving with the disk, which caused the circuit to be shortened at the instant when the type was vertical, brilliant sparks occurring only at

FIG. 2

FIG. .

THE PIPER BATTERY.

that instant, and illuminated the print, which, but for the buzzing caused by the great velocity of the disk, would have been supposed to be at rest.

By the application of this system, scientists and others have a ready means of observing any and all changes which may take place in either matter or machinery in rapid motion; in fact, the more rapid the motion the better is the result.

To show this experiment openly and in well-lighted libraries, a large supply of electricity is, of course, needed. This supply Mr. Wimsburst easily, and with certainty, furnished from one of his beautiful influence machines.

—— The American Electric Manufacturing Company are making sales of considerable quantities of apparatus of the American system of electric lighting in Canada. So much encouragement has been received from Canada by the American Company that they have decided upon establishing a factory for manufacturing the entire American apparatus in the city of Montreal. It is understood that some of the most prominent gas companies in the Dominion are to join the American Company in this enterprise.

—— The Badger Electric Light Company is making improvements in its plant at Racine, Wis.

—— The Pittsfield Illuminating Company, Pittsfield, Mass., has been incorporated. Capital stock, $25,000.

—— The Palmer Electric Co., Palmer, Mass., has been incorporated. Capital stock. $30,000. John F. Herry and others, incorporators.

—— The Ridley Electric Light and Power Company, Ridley Park, Pa., has been incorporated. Capital stock, $10,000. Robert Craven, incorporator.

—— The Napoleon Electric Light Company, Napoleon, Ohio, has been incorporated. Capital stock, $15,000. Alfred Beard, and others, incorporators.

—— The Jerseyville Electric Light and Power Company, Jerseyville, Ill., has been incorporated. Capital stock, $20,000. John G. Schwarz, and others, incorporators.

—— The Thomson-Houston Electric Light and Power Company, Buffalo, N. Y., has been incorporated. Capital stock, $500,000. Richard K. Noye, and others, incorporators. Heretofore the Brush Company has held the city of Buffalo against all competition.

—— The Electric Light Company, of Atlantic City, N. J., who recently purchased a 50 light machine of the American system, were so highly pleased with it that they immediately duplicated their first order for an additional 50 light outfit. The local company there are lighting the spectacular—"Ruins of Pompeii"—with the American system.

—— The United Carbon Companies received the following telegram from S. H. Paine, manager of the Western sales department of the Standard Oil Company in New York in reference to the article sent out by the Associated Press: "No such conference was held with the Standard Oil Company. We have not made any offer to dispose of our entire product of petroleum coke, and so far as we are concerned the whole matter is without foundation."

—— Electric lights were measured recently by Prof. Henry Morton, of Stevens Institute of Technology, in the city of New York, and he found that the best of what were called 2,000 candle power lamps gave only a power of 800 candles. He assumes that the term "2,000 candle power" has become a technical expression with the electric light companies to denote a lamp of from 500 to 1,000 actual candle power.

—— The first annual meeting of the Bickford Railroad Electrical Company was held in Portland last week. The capital stock was fixed at $125,000. The election of officers resulted as follows: Clerk, Wilson Nevins, of Portland; secretary, W. O. Chapman; treasurer, W. H. Gove; directors, Arthur Kemble, Winfield S. Nevins, John P. Peabody, John H. Bickford, W. H. Gove, S. F. Smith, all of Salem, Mass., and C. H. Harrison, of Boston. The company has already equipped trains with couplers on the Old Colony and Erie Railroads.

ELECTRIC LIGHT NEWS

—— The Brush Electric Light Company is building a new plant at Detroit, Mich.

—— The Liberty Electric Light Company, of Liberty, Mo., has been incorporated.

—— The Electric Service Company, of Buffalo, N. Y., has been incorporated, with a capital of $40,000.

—— Williams Brothers, of Rome, N. Y., have made a contract with the Loomis Electric Manufacturing Company for its system of electric lighting.

—— The Jamestown Electric Light and Power Company, Jamestown, N. Y., has been incorporated. Millard White, Boston, Mass., and others, incorporators.

—— The Fort Worth Electric Light and Power Company, of Fort Worth, Tex., will put in a new incandescent plant, with capacity for 1,500 to 2,000 lights.

—— The St. Croix Cotton Mills, Milltown, N. B., are to be lighted by electricity, and after the system is in running order it is intended to offer to extend it to St. Stephen and Calais for streets, stores, etc.

—— The Fresno Gaslight Company, of San Francisco, which introduced the Waterhouse electric light some time ago on trial, has ordered 100 additional lights, and will put up a 30x52-foot brick building for the plant.

—— The Electric Light and Power Company, of New Brighton, N. Y., has been incorporated, with a capital stock of $10,000, and Messrs. A. K. Gregory, D. Van Allen, Robert Maitland, Ph. S. Swain, and H. D. Fuller, as corporators.

—— The Bennington Electric Light and Power Company, of Portland, Me., has been incorporated, with a capital stock of $30,000. The officers are: President, Jas. W. Wakefield, Bath; Treasurer, Frank A. Sawyer, Portland.

—— Lieut. F. W. Toppan, of the U. S. Navy, well known in electrical circles, was placed on the retired list of naval officers on June 29th. The Edison company are fortunate in having secured the services of this popular young officer, and he will receive a hearty welcome from his colaborers in this field.

—— A commencement has been made at the port of Coquimbo, Chili, in electric lighting, Edison's system being employed. The dynamos, machinery, and other plant required for the installation have been procured from the United States. Mr. J. Grierson, the British Consul at Coquimbo, thinks that if the experiment proves successful neighboring localities will follow suit.

—— During the Agricultural Show at Chelmsford, England, last month, R. E. Crompton & Co. gratuitously lighted the main street of the village by a circuit of about two miles. Twelve Crompton lamps were used, the power being supplied by a small Marshall engine. The insulated wires were carried down the street on ropes, fastened from chimney to chimney. The lamps were also supported by ropes, and made a very effective combination with the numerous brightly-colored flags with which Chelmsford was decorated. The whole work was done in thirty-seven working hours, the fire-escape being used for fixing the lamps.

—— The ELECTRICAL REVIEW thinks that the people generally do not know how many street cars in this country are already moved by electricity. The REVIEW names Montgomery, Ala.; Appleton, Wis.; Baltimore, Los Angeles, Port Huron, Detroit, Scranton and Denver as cities where the street railroad lines use the electric motor, and find it a success, the expense being about one-half the cost of horse power. It is doubtful if either electric motors or cables will ever be tolerated for street surface railroads in New York. But it is surprising that the electric motor has not been tried on our elevated railroads. If a success, that is where it would be really valuable. The elevated road would lose its most objectionable features, if the trains could be moved by electricity. —N. Y. *World.*

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 5, 1887.

365,776, 365,777, 365,778, 365,779, 365,780 and 365,781 Telephone transmitter: James W. Bonta, Philadelphia, Pa., assignor to the American National Telephone Company, of New York.

365,787 Electric block system for pneumatic dispatch; Andrew Bryson, jr., and Henry S. Mudge, Brooklyn, N. Y.

365,792 Apparatus for measuring electricity; Jules Canderay, Paris, France.

365,843 Electrical breech-loading firearm; Edgar A. Monfort, New York, N. Y.

365,911 Police telephone system; William H. Eckert and John A. Seely, New York, N. Y.

365,935 Electro-magnetic annunciator drop; Jos. J. O'Connell, Chicago, Ill.

365,978 System of electrical distribution; Thos. A. Edison, Llewellyn Park, N. J.

365,982 Transmitter for printing telegraphs; Stephen D. Field, New York, N. Y., assignor to himself and John Anderson, same place.

365,994 Printing telegraph; Clarence L. Healy, Brooklyn, N. Y., assignor to the Commercial Telegram Company, New York, N. Y.

366,021 Electro-magnetic motor; Henry M. Paine, Newark, N. J.

366,164 Electrolytic vaporizer for medicinal purposes; Manly M. Gillam, Philadelphia, Pa.

366,166 Printing telegraph transmitter; Clarence L. Healy, Brooklyn, assignor to the Commercial Telegram Company, New York, N. Y.

366,173 Junction box for electric conductors; and 366,174, Electrical conductor; John Kruesi, Brooklyn, assignor to the Edison Machine Works, Schenectady, N. Y.

366,176 Thermotic circuit-closer; John C. Mackey, Phœnix, N. Y.

366,178 Printing telegraph receiver; Henry Mahnken and Clarence L. Healy, Brooklyn, assignors to the Commercial Telegram Company, New York, N. Y.

366,184 Electric rock drill; Lucius J. Phelps, New York, N. Y., assignor to Charles A. Cheever, trustee, same place.

366,190 Electric telephony; Alfred G. Safford, Washington, D. C., assignor of one-half to S. S. Bullock, Oakland, Cal.

366,192 Polarized relay; Granville T. Woods, Cincinnati, Ohio.

BUSINESS NOTICE.

"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court [7 Beekman St.,] New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World's* Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer.*

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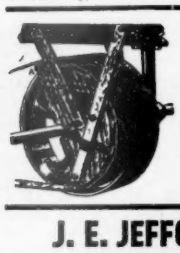

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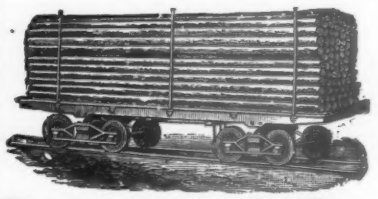

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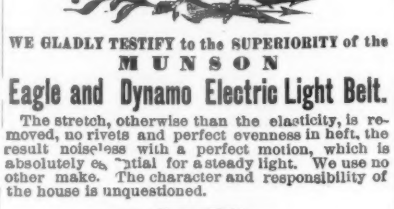

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